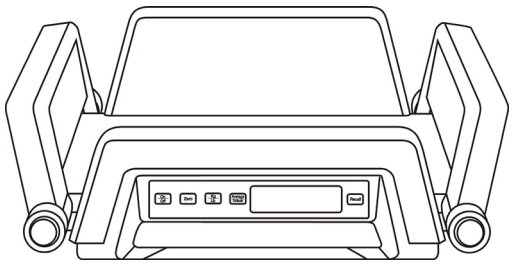
natus®
pediatrics



Instruction Manual

OLYMPIC SMART SCALE®

Model 50/51

⚠ CAUTION	Read and be familiar with this manual before installing, operating, or servicing this device. To ensure operator, technician, and patient safety, use only as specified in this manual.

602016C

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Section

1

Overview

This manual provides the necessary information to install, maintain, and service the Olympic Smart Scale® Model 50/51. The operating instructions in this manual are intended for use under the direct supervision of a licensed medical practitioner. The installation and service instructions in this manual are intended for use by qualified service technicians.

Conventions

The following conventions are used in this manual.

Table 1.1 Conventions

Convention	Description
NOTE	Notes provide additional information to clarify a point in the text.
CAUTION	Cautions indicate situations that, if not avoided, could result in minor to moderate injury to the patient or operator, or damage to the equipment.
WARNING	Warnings indicate situations that, if not avoided, could result in serious injury or death to the patient or operator.
BUTTON	This character style represents buttons and controls that the user can touch or press.

Symbols

The following symbols are located on the Olympic Smart Scale and its packaging.

Table 1.2 Symbols

Symbol	Definition
	Alternating current (ac) voltage
	Atmospheric pressure
	Caution, read instructions
	Electrical shock hazard
	Fuse
	Humidity, condensing
L	Line (hot conductor)
N	Neutral (neutral conductor)

Symbol	Definition
	Nonionizing electromagnetic radiation
	Protective earth (ground)
	Rechargeable battery
	Shipping
	Storage
	Temperature
	Type B equipment
	Legal manufacturer

Intended Use

The Olympic Smart Scale® Model 50/51 is intended for weighing infants and children up to 55 lb (25 kg).

Description

The Olympic Smart Scale Model 50/51 is a scale that quickly and safely weighs pediatric patients, from infants to toddlers. It features folding ends to easily accommodate the patient (see Figure 1.2). The scale operates on rechargeable batteries or power from a hospital-grade electrical outlet.

The Model 50 is a table-top model, while the Model 51 roll-around model comes attached to a cart (mobile base), which makes it the perfect height for use with all models of Olympic Warm-Lamps.

Figure 1.1 Smart Scale Model 50/51

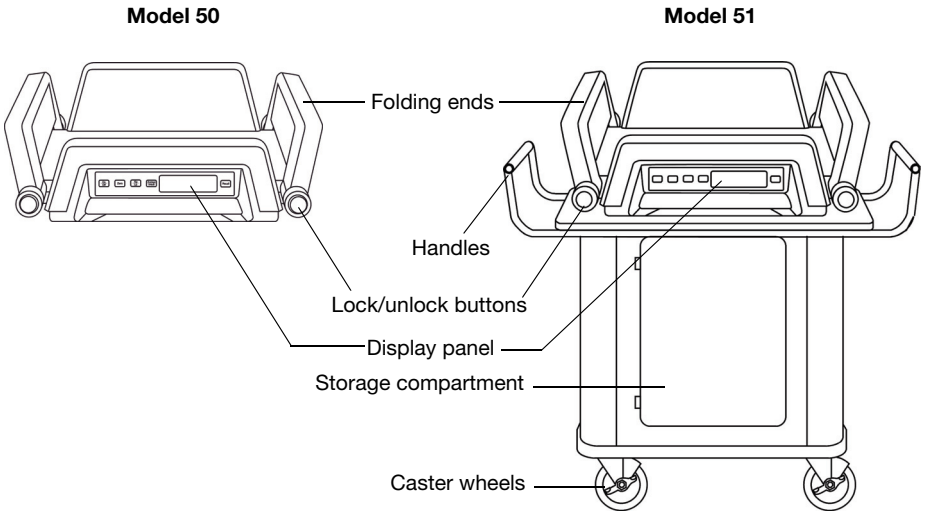
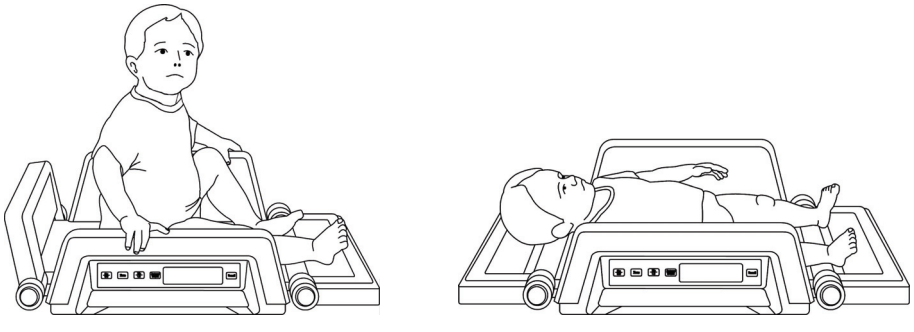


Figure 1.2 Folding ends accommodate the patient

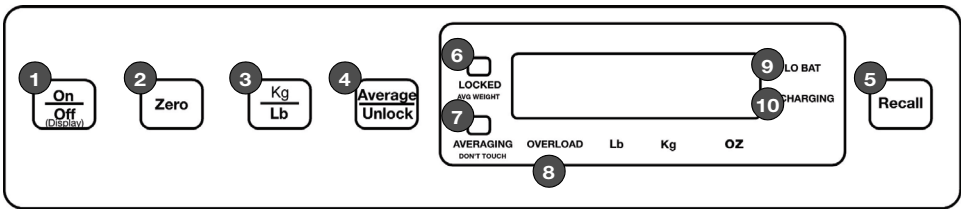


One side down

Both sides down

Controls and Status Lights

Figure 1.3 Controls and status lights



Control Buttons

1 **ON/OFF (Display).** Turn the scale display on or off.

NOTE If operating on batteries, the scale automatically turns off after three minutes of inactivity.

2 **ZERO.** Cancels (tares out) the weight of any objects (e.g., blankets, toys) on the weighing platform; use before placing the patient on the platform.

3 **KG/LB.** Changes the display between measurement units of pounds-ounces and kilograms.

4 **AVERAGE/UNLOCK.** Calculates a four-second average of an active patient's weight and locks it on the display. Press again to unlock the display.

5 **RECALL.** Displays the last locked weight after the display has turned off.

NOTE **RECALL** only operates when the scale display is off. The scale display automatically turns off after 10 seconds of inactivity.

Status Lights

6 **LOCKED (green).** The patient's average weight is locked on the display. The weight shown will remain on the display when the patient is removed from scale.

7 **AVERAGING (yellow).** The scale is computing a four-second average of the patient's weight. Avoid touching the patient and platform while the **AVERAGING** light is flashing.

CAUTION Touching the platform or patient while the **AVERAGING** light is blinking can result in an incorrect weight (see *Weight Lock/Unlock (AVERAGE/UNLOCK)* on page 3-4).

8 **OVERLOAD.** The weight on the platform exceeds 55 lb (25 kg).

9 **LO BAT.** Indicates low or depleted battery charge. Lit and steady means that approximately 30 minutes of battery life remain. Blinking means that the battery charge is depleted, and the scale will automatically shut off. If this indicator is lit or blinking, plug the scale into an electrical outlet to recharge the battery (see page 4-2).

10 **CHARGING.** The batteries are charging. The scale can be used while the batteries are charging.

Averaging the Weight of an Active Patient

The Olympic Smart Scale detects movement and accurately calculates the weight of an active, moving child. When weight-force is applied to the tray, electronic signals from the load cells are processed by a series of electronic filters and a microprocessor that detect motion and calculate an averaged weight.

Weight is sampled at 16 Hz (16 samples per second). Every six samples are averaged to produce one reading. In normal operating mode, this reading is shown on the display.

When **AVERAGE/UNLOCK** is pressed, an electronic smoothing filter is activated and each reading (six sample average) is compared to the previous reading. If the reading is within ±200 g, it is averaged with the previous reading. If eight consecutive readings are within ±200 g, the weight locks on the display. If, after sixteen readings, eight readings are not within ±200 g, the scale locks the last average on the display. This process occurs in just four to six seconds.

To assure accuracy, Natus Medical determined the design parameters for calculating averaged weight by weighing active infants on a special platform using a strip chart recorder to measure the dynamic forces generated by the infant's weights and movements. The software program for weight-averaging was then verified by further extensive testing in nurseries.

With its sophisticated weight-averaging techniques, the Model 50/51 can weigh a moving infant to an accuracy of 20–40 grams.

Section

2

Installation

WARNING **Electrical shock hazard when the enclosure is open. Unplug the power cord from the electrical outlet when installing this device.**

CAUTION
- Only qualified technicians should assemble this device.
- Read and be familiar with this instruction manual before assembling this device.

Installing the Smart Scale

The Smart Scale requires minimal handling during unpacking and installation.

NOTE The scale is heavy and awkward; two people should lift the scale. To pick it up, firmly grasp the bottom of the scale; never attempt to lift the scale by its sides.

To install the Smart Scale Model 50:

- Before using the scale, remove and discard the green protective display cover.
- Place the scale on a sturdy, flat, level table or countertop.

CAUTION Ensure that the scale is away from the edge so that it cannot slide or “walk” off the table or countertop.

- Attach the scale to a mobile cart or table: Four threaded (10-32 UNF) holes are provided in the base plate of the scale for bolting it to a cart or table (see Figure 2.2). The scale’s rubber feet may remain attached.

CAUTION If using the scale on a cart, securely anchor the scale to the cart. Confirm that the cart/scale combination is stable at 10° of tilt with 25 kg weight on a platform end in its down position.

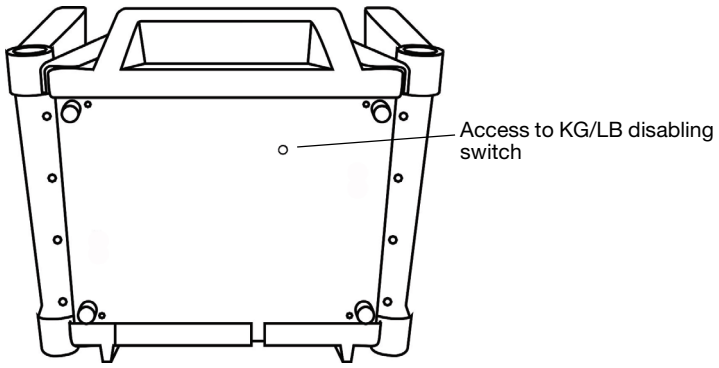
Locking Units to Kilograms (optional)

The standard configuration of the scale allows you to toggle the units of measurement between metric and English (kilograms and pounds). You can permanently lock the units to measure kilograms only.

To permanently lock the units to kilograms:

1. Press **ON/OFF** on the front panel to turn on the scale.
2. Press **KG/LB** until kilograms are selected.
3. Press **ON/OFF** to turn off the scale.
4. Lift and turn over the scale to gain access to the **KG/LB** disabling switch. With the scale oriented as shown in Figure 2.1, you can access the switch through the 3/8" hole on the right side of the bottom of the scale.

Figure 2.1 Bottom of Smart Scale — **KG/LB** disabling switch



5. Flip the **KG/LB** disabling switch to the left.
6. Press **ON/OFF** to turn on the scale.
   The units are now locked to kilograms.
7. Press **KG/LB** to verify that the units are locked to kilograms.
   If locked, the display should still show kilograms.
8. Place the **Locked to KILOGRAMS** label over the **KG/LB** switch.

Attaching the Smart Scale to Its Cart (Mobile Base)

NOTE Natus Medical manufactures a cart (mobile base) for the Smart Scale Model 50. The Model 51 is the Smart Scale Model 50 with this cart.

CAUTION Before using the scale on a cart, securely attach the Smart Scale to the cart as described in the following instructions.

Required Items:

- Smart Scale
- Cart (mobile base)
- Probe
- Mounting hardware

NOTE The mounting hardware (four #10-32 screws, washers, and nylon spacers) and caution label is taped to the inside of the cart.

To attach the scale on the cart:

1 Place the scale on top of the cart, then open the cabinet door of the mobile base.

2 Using the probe, align the four threaded holes in the scale (see Figure 2.2) with the four mounting holes in the top of the cart (see Figure 2.3).

3 Inside the cart, place the washers on the mounting screws, then insert the mounting screws through the mounting holes in the cart (see Figure 2.3) and tighten until the scale is securely attached.

4 Remove the backing from the caution label, which is included with the mounting hardware, then press the label above the "Summary Instructions" on the back panel of the scale (see Figure 2.3).

Figure 2.2 Bottom of Smart Scale — threaded holes

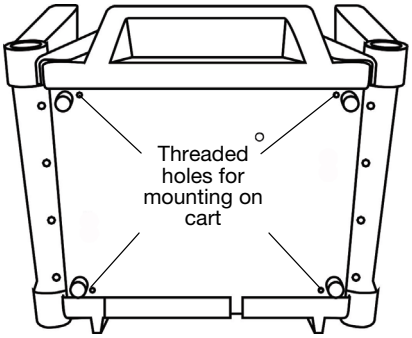
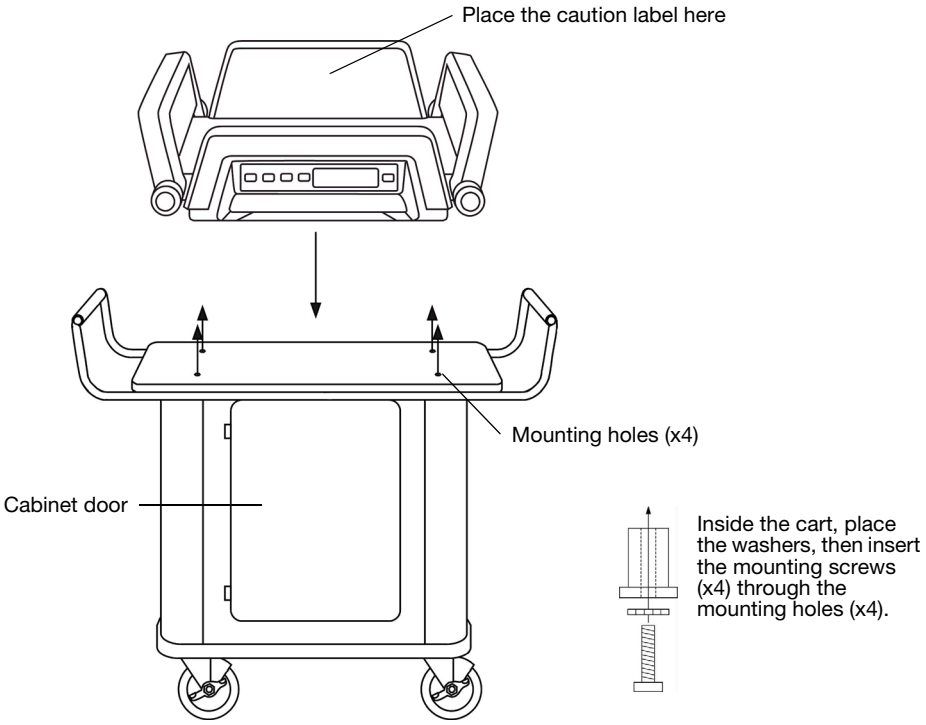


Figure 2.3 Installing the scale on the base


Place the caution label here
Mounting holes (x4)
Cabinet door
Inside the cart, place the washers, then insert the mounting screws (x4) through the mounting holes (x4).

Before First Use

Initial Battery Charge

The Smart Scale has internal rechargeable batteries that automatically charge whenever the scale is plugged into an electrical outlet. Before operating the scale on its batteries for the first time, charge the batteries for approximately 2.5 hours to reach full charge. The scale can be used while the batteries are charging. For more information, see page 4-2.

> ⚠ **CAUTION** Connect this device directly to a properly grounded hospital-grade outlet.

Calibration Check

The scale was calibrated before shipment. However, due to local variations in the force of gravity, which can affect calibration by as much as 20 g, recalibrate the scale before use (see page 4-3).

Testing the Device

Perform the test procedure to ensure the Smart Scale is working properly after performing assembly and service procedures.

Required Items:

- Calibration weights (part no. 56357)

To test the Smart Scale:

1. Press and hold **KG/LB** while pressing **ON/OFF**.
2. Verify that all lights illuminate.

NOTE The charging signal only illuminates when the scale is plugged into a functioning electrical outlet.

3. Place the calibration weights on the scale, then confirm that the correct weight displays.
4. Press **ON/OFF** to turn off the scale.

NOTE If the device does not operate as expected, see *Troubleshooting* on page 5-1.

Section

3

Operation

WARNING **Explosion hazard. Do not use this device in the presence of flammables (e.g., oxygen, nitrous oxide, anesthetics).**

CAUTION

- Read and be familiar with this instruction manual before using this device.
- Only use this device under the direct supervision of a licensed medical practitioner.
- Connect this device directly to a properly grounded hospital-grade outlet.
- If the scale is mounted on a mobile cart or table, always lock the wheel casters before placing the patient in the scale.
- Keep the platform ends in either the full-down or full-up positions. Ends are locked in the full-up position only when **LATCHED** appears (see Figure 3.3).
- Do not allow the patient to sit or stand on the platform ends.
- Always watch the patient while on the weighing platform; to avoid injury, prevent the patient from crawling off of the weighing platform.
- Never use the scale to transport the patient.
- Touching the platform or patient while the **AVERAGING** light is blinking can result in an incorrect weight; see *Weight Lock/Unlock (AVERAGE/UNLOCK)*.
- Always clean/disinfect the scale between patients.

NOTE It is the responsibility of the hospital/facility to ensure that all personnel who operate or maintain this device are trained in its operation and safe use, and to maintain training records of attendance and evidence of understanding.

Operating the Smart Scale

To operate the Smart Scale:

NOTE

- The scale can be used while the batteries are charging.
- Only use your fingers to press the buttons. Pens and other devices may puncture the membrane display panel.
- Objects, such as blankets, placed on the scale before **0** appears are not weighed — they are automatically tared out (see page 3-4).

1 Press **ON/OFF** to turn on the scale.

A series of moving dashes appear on the display. Next, the 0 weight reading appears, indicating the scale has automatically found its zero reference point.

2 If mounted on a cart, lock the caster wheels (for the Model 51, see page 3-2).

3 Adjust the platform ends, as appropriate (see page 3-3).

4 Place the patient on the platform:

- For still patients, the weight automatically displays. Read and record the weight.
- For active patients, press **AVERAGE/UNLOCK** to average the weight and lock it on the display. Read and record the weight, then press **AVERAGE/UNLOCK** to unlock the display.

NOTE For information on averaging the weight of an active patient, changing the display units, and canceling the weight of objects (e.g., blankets), see page 3-4.

CAUTION
- Always watch the patient while on the weighing platform; to avoid injury, prevent the patient from crawling off of the weighing platform.
- Always clean/disinfect the scale between patients.

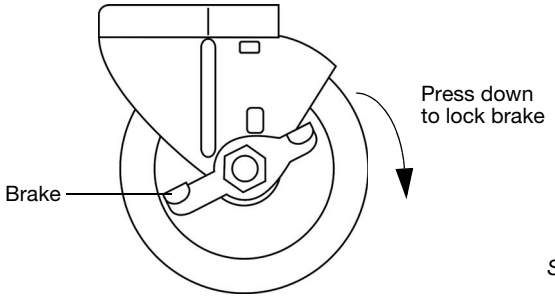
Setting the Caster Brakes

To set or release the brakes:

- Step on the left side of the brake lever to set the brake; step on the opposite side to release the brake (see Figure 3.1). There are two locking casters on the Model 51 cart.

CAUTION Always lock the wheel casters before placing the patient in the scale.

Figure 3.1 Setting the caster brake



Shown in unlocked position

Adjusting the Platform Ends

To adjust the platform ends:

- While holding the platform end press the large red button labeled **PUSH TO UNLATCH** (see Figure 3.2), then gently lower the platform end to the full-down position.

NOTE Lower one or both ends to accommodate the patient being weighed. Whenever possible, at least one platform end should remain up to help confine the patient.

CAUTION

- Keep the platform ends in either the full-down or full-up positions. Ends are locked in the full-up position only when **LATCHED** appears (see Figure 3.3).
- Do not allow the patient to sit or stand on the platform ends.

- To return an end to the full-up position, lift the end until it locks into place and **LATCHED** appears on the button's rim (see Figure 3.3).

Figure 3.2 Adjusting the platform ends

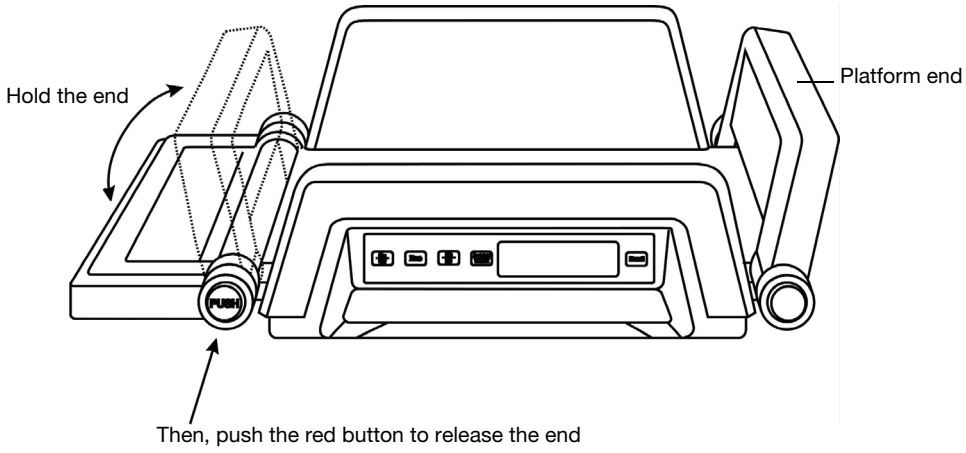
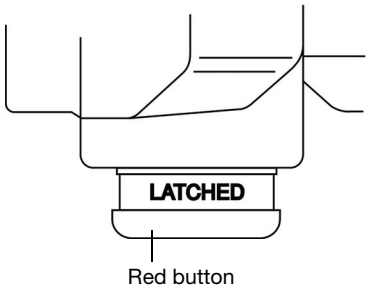


Figure 3.3 Locking the ends into position



The end is only locked in the "up" position when **LATCHED** appears.

Weighing the Patient

> **CAUTION** Always clean/disinfect the scale between patients.

Kilograms/Pounds-Ounces

When the scale is first turned on, it shows the weight in the last-used units. To change the display weight, press **KG/LB**. Kilograms display to 0.02 kg.

> **NOTE** This scale has an option to permanently lock the measurement units to kilograms (see *Locking Units to Kilograms (optional)* on page 2-1).

Zeroing the Weight of Objects

The weight of objects, such as blankets, can be zeroed (i.e., tared out, canceled) to ensure that the patient weight is accurate.

To tare a weight:

- If the scale is on, place the object on platform, then press **ZERO**.
- If the scale is off, place the object on the platform, then press **ON/OFF**.

> **NOTE**
> - When the weight of the object is zeroed, the display shows **0**.
> - If the object is removed from the platform after its weight has been zeroed, the scale shows a negative weight. Press **ZERO** to re-zero the scale.
> - When an object is on the platform and the display shows **0**, its weight has been zeroed. If a patient is then placed on the platform, only the patient's weight will display.

Patient Still, Not Moving

If the patient remains still, the weight appears on the display.

Patient Active, Moving

If the patient is active and the weight shown changes rapidly, press **AVERAGE/UNLOCK**. The **AVERAGING** light blinks while the Smart Scale averages the patient's weight over four seconds. When the averaged weight is computed, the **LOCKED** light illuminates and the weight locks on the display.

> **CAUTION** Touching the platform or patient while the **AVERAGING** light is blinking can result in an incorrect weight; see *Weight Lock/Unlock (AVERAGE/UNLOCK)*.

Weight Lock/Unlock (AVERAGE/UNLOCK)

When the **LOCKED** light illuminates, the weight remains locked on the display. Press **AVERAGE/UNLOCK** to unlock the display, or turn off the scale if weighing is complete.

If the scale is touched during averaging:

1 Wait for the **LOCKED** light to illuminate.

2 Press **AVERAGE/UNLOCK** to unlock the display.

3 Press **AVERAGE/UNLOCK** to recalculate and display the patient's weight.

Recalling the Last Locked Weight

If the Smart Scale is turned off or loses power, press **RECALL** to display the last locked-in weight. The scale display will come on, display the last locked weight for 10 seconds, and then turn off.

NOTE The weight can only be recalled when the display has turned off.

Weighing the Next Patient

Before weighing the next patient, the scale display must show **0**. If the display is locked (**LOCKED** light illuminates), press **AVERAGE/UNLOCK**. The scale should show **0**; if not, press **ZERO**.

CAUTION Always clean/disinfect the scale between patients.

Overload

If the load exceeds 55 lb (25 kg), the **OVERLOAD** light illuminates and blinks, indicating that the weight on the scale platform is too heavy. Remove extra objects, or the patient, from the scale.

Section

4

Maintenance

WARNING **Electrical shock hazard when the enclosure is open. Unplug the power cord from the electrical outlet before cleaning this device.**

CAUTION

- Only qualified technicians should perform maintenance procedures.
- Do not allow liquid to enter the enclosure as liquids may cause a shock hazard or damage the internal wiring.
- Never use alcohol to clean the device as alcohol will damage the plastic.
- Always clean/disinfect the scale between patients.

Cleaning the Smart Scale

Required Items:

- Soft cleaning cloths
- Mild cleaning detergent (e.g., Virex™ Tb, Virustat®, Coverage®) or mild soap-and-water solution
- Disinfectant (e.g., Sporicidin®)

To clean the Smart Scale:

1. If the scale is on, press **ON/OFF** to turn off the scale, then unplug the power cord.
2. Dampen the cleaning cloth with either the mild soap-and-water solution or the liquid disinfectant, then wipe down all exterior surfaces of the Smart Scale. Use the second cloth to dry all exterior surfaces of the Smart Scale.

Charging the Battery

The Smart Scale has internal rechargeable batteries that automatically charge (**CHARGING** signal illuminates) whenever the scale is connected to a functioning electrical outlet.

> **CAUTION** Connect this device directly to a properly grounded hospital-grade outlet.

NOTE

- Partially discharging and recharging the rechargeable batteries repeatedly over time will lead to premature battery failure. To prolong battery health, occasionally run the scale on battery power alone until the cells are fully discharged, then fully recharge the battery for 2.5 hours.
- Charge new batteries for approximately 2.5 hours to reach full charge before operating the Smart Scale on battery power.
- Batteries can be continuously charged without damage.
- The scale can be used while the batteries are charging.

To recharge the battery:

- Plug the power cord into a hospital-grade electrical outlet. Allow the battery to recharge for at least 2.5 hours.

Battery Charge Life

When fully charged, the scale will operate for approximately three hours of continuous use—enough battery power for about 100 weighings.

Low Battery (LO BAT)

The **LO BAT** signal indicates how much battery life remains:

- If slowly blinking, the battery is getting low.
- If lit and steady, approximately 30 minutes of continuous battery-powered operation time remains.
- If rapidly blinking, the battery charge has been depleted and the scale will automatically turn off. Connect the scale to a functioning electrical wall outlet for recharging.

When **LO BAT** appears, connect the scale to an electrical outlet to recharge the battery.

Calibrating the Smart Scale

As with any precision electronic instrument, the scale can drift out of calibration over time. Calibrate the Smart Scale before first use and every six months.

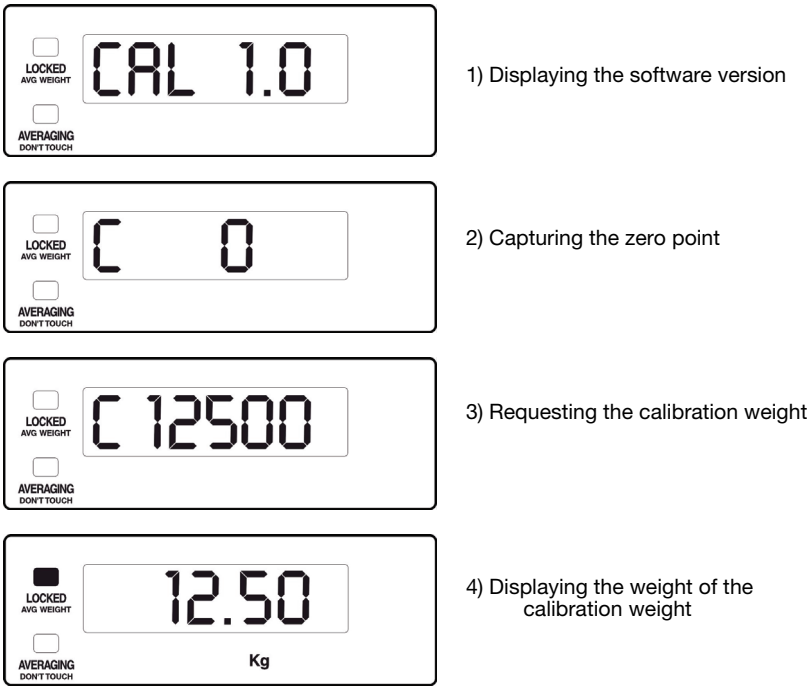
Required Items:

- Calibration weights (part no. 56357)

To calibrate the Smart Scale:

1. Place the scale on a firm, level surface and protect it from moving air. Confirm that the ambient temperature is 70–75°F (21.1–23.9°C).
2. Press and hold **ZERO**, then press **ON/OFF** to enter calibration mode (see Figure 4.1); confirm the following:
   - The current software version (e.g., **CAL 1.0**) appears.
   - **C 0** appears while the scale captures the zero point.
   - **C 12500** appears prompting for placement of the 12.5 kg calibration weight.
3. Place the two calibration weights (totaling 12,500 grams) on the center of the platform. Calibration is successfully completed when **12.50** kg displays (see Figure 4.1).

Figure 4.1 Calibration mode displays



4. Remove the calibration weight from the scale, then press **ZERO**.
5. Press **ON/OFF** to turn off the scale.

Section

5

Troubleshooting

Should you experience difficulty when operating your Smart Scale, consult the following table. For problems not listed in the table, contact Natus Medical (see page 5-4).

Table 5.1 Troubleshooting chart

Problem	Probable Cause	Solution
Scale won't turn on	No power	Make sure the power cord is plugged in.
	Depleted battery	Plug the device into an electrical outlet and allow the battery to charge for 2.5 hours. If the battery doesn't charge, replace the battery pack (see page 6-7).
	Blown fuse(s)	Replace the fuse(s) (see page 6-5).
	Damaged membrane control panel	Test the membrane control panel (see page 6-8).
	Damaged power supply printed circuit board (PCB)	Test the power supply PCB (see page 6-9); replace if necessary (see page 6-12).
	Damaged display PCB	Test the display PCB (see page 6-9); replace if necessary (see page 6-12).
	Damaged display panel cable	Test the display panel cable (see page 6-9).
	Main PCB U11 goes "logic low" when **ON/OFF** is pressed	Replace the main PCB (see page 6-12).
KG/LB won't change measurement units	**KG/LB** disabling switch is active	Deactivate the **KG/LB** disabling switch (see *Locking Units to Kilograms (optional)* on page 2-1). **Note:** Some facilities activate this switch so the display will only show kilograms. Check your facility's guidelines before deactivating the switch.
	Damaged membrane switch panel	Test the membrane switch panel (see page 6-8).
	Damaged display panel cable	Test the display panel cable (see page 6-9).
	Damaged main PCB	Test the main PCB (see page 6-9); replace if necessary (see page 6-12).

Table 5.1 Troubleshooting chart, continued

Problem	Probable Cause	Solution
Incorrect or inaccurate weight	Incorrect unit of measurement	Press **KG/LB** to change unit of measurement.
	Object rubbing against weighing platform or platform assembly	Check the weighing platform for objects (e.g., power cord, blankets) rubbing against it; remove the objects.
		Remove the platform assembly and check for objects (e.g., cables, enclosure) interfering with the weighing platform.
	Out of calibration	Calibrate the scale (see page 4-3).
	Wrong value weight used for calibration	Use the appropriate value weight when calibrating the scale (see page 4-3).
	Improper calibration technique	Use proper techniques when calibrating the scale (see page 4-3).
	Electromagnetic interference	Check for electromagnetic interference (see page 8-4).
	Damaged load cell	Contact Natus Medical (see page 5-4).
	Damaged main PCB	Test the main PCB (see page 6-9); replace if necessary (see page 6-12).
	Damaged power supply PCB	Test the power supply PCB (see page 5-4); replace if necessary (see page 6-12).
Dashes “walk” across display but scale won’t show **0**	Out of calibration	Calibrate the scale (see page 4-3).
	Damaged load cell	Contact Natus Medical (see page 5-4).
	Signal beyond zero capture range or unstable	With the platform on the scale, place the scale in counts mode (see page 6-12). The counts shown must be between 9000 and 13500. If it is out of range, contact Natus Medical (see page 5-4).
		With the platform on the scale, place the scale in counts mode (see page 6-12). If the shown counts fluctuate more than ±4, contact Natus Medical (see page 5-4).
CHARGING doesn’t light when scale is plugged into electrical outlet	Blown fuse(s)	Replace the fuse(s) (see page 6-5).
	Battery pack isn’t connected	Check the battery pack connection.
	Damaged battery	Test the battery pack to determine if it is at 8.4V when fully charged. If not, replace the battery pack (see page 6-7).
	Damaged main PCB	Test the main PCB (see page 6-9); replace if necessary (see page 6-12).
	Damaged power supply PCB	Test the power supply PCB (see page 6-9); replace if necessary (see page 6-12).
	Damaged display PCB	Test the display PCB (see page 6-9); replace if necessary (see page 6-12).

Table 5.1 Troubleshooting chart, continued

Problem	Probable Cause	Solution
CHARGING lights, but scale won't operate on battery power	Depleted battery	Plug the device into an electrical outlet and allow the battery to charge for 2.5 hours. If the battery doesn't charge, replace the battery pack (see page 6-7).
	Damaged battery	Test the battery pack to determine if it is at 8.4V when fully charged. If not, replace the battery pack (see page 6-7).
	Power supply PCB damaged	Replace the power supply PCB (see page 6-9).
LOCK/AVERAGE won't lock or average weight	Damaged membrane switch panel	Test the membrane switch panel (see page 6-8).
	Damaged display panel cable	Test the display panel cable (see page 6-9).
	Damaged main PCB	Test the main PCB (see page 6-9); replace if necessary (see page 6-12).
ZERO won't zero object on scale	Objects not on scale	Place the objects (e.g., blankets, toys) on the scale, then press **ZERO** to cancel their weight. Next, add the patient to the scale and read the weight.
	Damaged membrane switch panel	Test the membrane switch panel (see page 6-8).
	Damaged display panel cable	Test the display panel cable (see page 6-9).
	Damaged main PCB	Test the main PCB (see page 6-9); replace if necessary (see page 6-12).
Scale won't lock weight on display and **LOCKED** doesn't illuminate	Damaged main PCB	Test the main PCB (see page 6-9); replace if necessary (see page 6-12).
RECALL won't display last locked weight	Scale display on	**RECALL** only operates when the scale display is off.
	Damaged membrane switch panel	Test the membrane switch panel (see page 6-8).
	Damaged display panel cable	Test the display panel cable (see page 6-9).
	Damaged main PCB	Test the main PCB (see page 6-9); replace if necessary (see page 6-12).
RECALL always shows zero	Damaged main PCB	Test the main PCB (see page 6-9); replace if necessary (see page 6-12).
Scale won't calibrate; stops at C 0	Object on platform	Ensure that no objects (e.g., weight) are on the scale.
	Excess vibration	Place the scale on a stable surface.
	Damaged load cell	Contact Natus Medical (see page 5-4).
Scale won't calibrate; stops at C 12500	Incorrect calibration weight	Use an NIST traceable 12.5-kg weight.
	Excess vibration	Place the scale on a stable surface.
	Damaged load cell	Contact Natus Medical (see page 5-4).
Error code E901 (Cal Error)	Counts out of allowable capture window	Calibrate the scale (see page 4-3).
		Possible load cell failure; contact Natus Medical (see page 5-4).

Table 5.1 Troubleshooting chart, continued

Problem	Probable Cause	Solution
Error code E905 (Check Sum Error)	Non-volatile memory corrupted or damaged	Calibrate the scale (see page 4-3).
		Test the main PCB (see page 6-9); replace if necessary (see page 6-12).
Unreadable display/garbled	Electrical fast transient bursts	Install a filter on power input lines. Contact Natus Medical (see page 5-4).

Technical Support

For technical support, contact Natus Medical at:

Toll-free: 1-866-940-7143 (US/Canada)
Phone: +1-206-767-3500 (international)
Fax: +1-206-767-0573
Email: Seattle_technical_service@natus.com

Section

6

Service

WARNING **Electrical shock hazard when the enclosure is open. Unplug the power cord from the electrical outlet before servicing this device. Whenever power is required for testing, use battery power.**

CAUTION

- Only qualified technicians should perform service procedures.
- Read and be familiar with this instruction manual before servicing this device.
- Reattach all ground wires after servicing to ensure proper grounding.
- The printed circuit boards (PCBs) contain static sensitive parts. Always use appropriate electrostatic discharge protection, such as an electrical-grounding wrist strap, when working with internal components.
- Always recalibrate the Smart Scale after disassembly/reassembly (see page 4-3).

Repair Policy

Do not use malfunctioning equipment. To promote product reliability, a qualified technician may perform the replacement and service procedures described in this section. Before servicing your equipment, check your equipment warranty status, check the normal repair procedures for your facility, and determine the appropriate repair procedure to perform.

To ensure performance to factory specifications, it is recommended that all replacement parts be those either manufactured or sold by Natus Medical. After all repair actions and tests are complete, perform the pre-operative test procedure in this manual (see page 2-5) to ensure proper operation and compliance with published specifications.

Printed Circuit Boards

Observe proper handling cautions at all times. The integrated circuits and semiconductors on the printed circuit boards (PCBs) can be damaged by electrostatic discharge or contamination by body oil. Return the Smart Scale to Natus Medical for repair or replacement of faulty PCBs.

Repair Procedures

Consult the troubleshooting chart (see page 5-1) to identify probable causes and solutions before performing repair procedures.

WARNING **Electrical shock hazard when the enclosure is open. Unplug the power cord from the electrical outlet before servicing this device.**

CAUTION

- Reattach all ground wires after servicing to ensure proper grounding.
- Note the location of the lock washers when disassembling the device. To ensure ground integrity, reseat all washers when reassembling the device.
- Printed circuit boards (PCBs) contain static-sensitive parts. Always use appropriate electro-static device (ESD) protection when the enclosure is removed.
- Always recalibrate the Smart Scale after disassembly/reassembly (see page 4-3).

Disassembling the Smart Scale

It may be necessary to disassemble the Smart Scale to perform a service procedure.

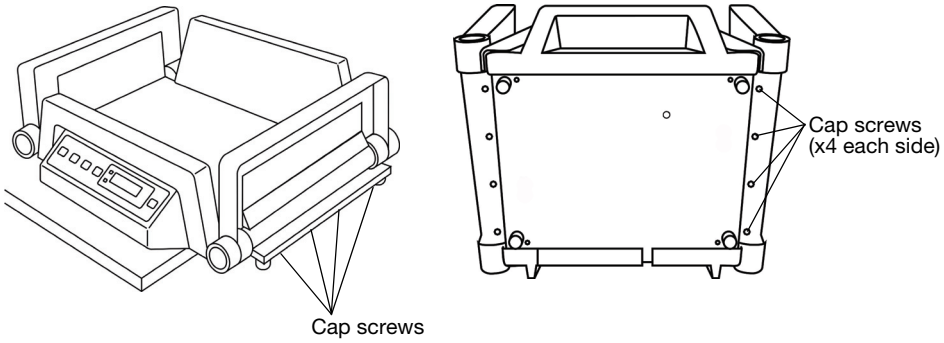
Required Items:

- Allen wrench

To disassemble the scale:

1. If the scale is on, press **ON/OFF** to turn off the scale, then unplug the power cord.
2. If the scale is mounted to a cart or table, remove it.
3. Remove the cap screws (see Figure 6.1):
   a. Slide one end of the scale just over the edge of a table.
   b. Unscrew the four socket-head cap screws.
   c. Repeat steps a and b on the other end.

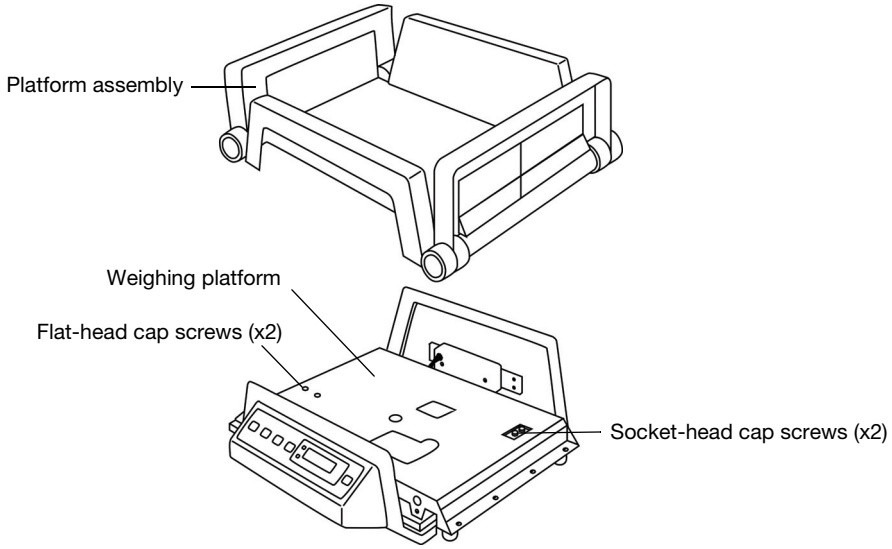
Figure 6.1 Accessing the socket-head cap screws



4. Lift the platform assembly up to expose the weighing platform (see Figure 6.3).

NOTE The platform assembly, with its hinged ends, cannot be repaired in the field and should not be disassembled. If it is damaged, return it to Natus Medical for repair or replacement.

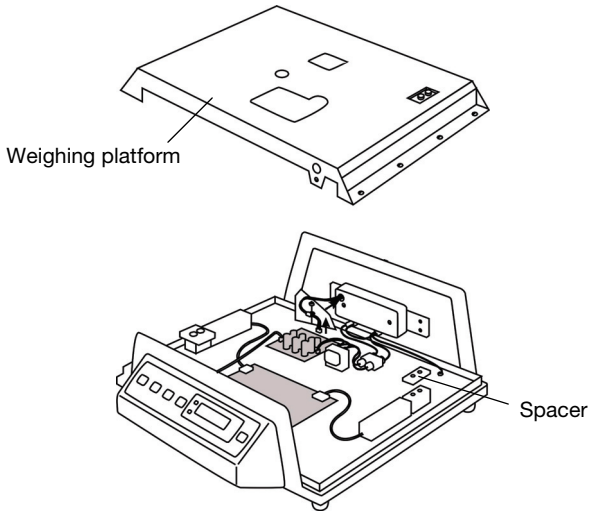
Figure 6.2 Exposing the weighing platform



5 Remove the weighing platform:

- **a** Remove the two socket head cap screws and the two flat head cap screws (see Figure 6.2).
- **b** Lift the weighing platform to expose the PCBs (see Figure 6.3).
- **c** Place the spacer in a safe location.

Figure 6.3 Exposing the PCBs



Reassembling the Smart Scale

After performing a service procedure, reassemble the Smart Scale and verify that it operates correctly before use.

Required Items:

- Allen wrench

To reassemble to scale:

1 Attach the weighing platform:

NOTE When reinstalling the weighing platform, confirm that the channel connected to the right load cell is square and that the swing arms move freely.

a Place the spacer on the base (see Figure 6.3).

b Place the weighing platform on the base, then secure with the two socket-head cap screws and the two flat-head cap screws.

- Apply 90-in.–lb. torque to the two socket-head cap screws.
- Tighten the two flat-head cap screws firmly; these screws require minimal force to secure.

c Slide one end of the scale so that it hangs over the edge of the table, then secure the four socket-head cap screws underneath the device.

- Apply 5-in.–lb. ±1 torque to the cap screws that attach the main platform to the chassis.

d Repeat step c on the other end.

2 Calibrate the scale (see page 4-3).

CAUTION Always recalibrate the Smart Scale after disassembly/reassembly (see page 4-3).

Replacing the Fuses

If the device does not function when the power cord is plugged in and the power is turned on, a fuse may be blown. The Smart Scale has two fuse locations—one accessible by disassembly and two accessible from the back of the device.

Main Fuses

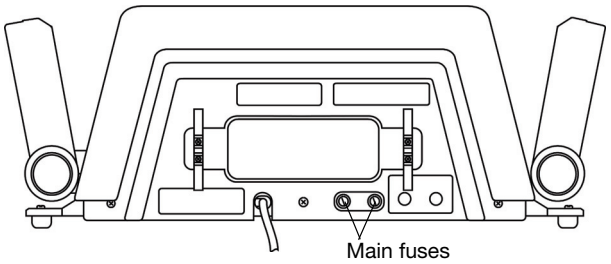
Required parts:

- Main fuses, x2 (part no. 200021)

To replace the main fuses:

1. If the scale is on, press **ON/OFF** to turn off the scale, then unplug the power cord.
2. Remove the fuses (see Figure 6.4):
   a. Locate the fuse cover caps of the main fuses.
   b. Push in and turn the fuse cover caps, then pull the caps and fuses out of the scale.
3. Insert the new fuses: Place the new fuses into the fuse cover caps, then turn to secure.

Figure 6.4 Replacing the main fuses



Internal Fuse

Required parts:

- Pico fuse, x1 (part no. 200021)
- ESD protection
- Allen wrench
- Solder gun and solder

To replace the pico fuse:

1. If the scale is on, press **ON/OFF** to turn off the scale, then unplug the power cord.
2. Disassemble the scale (see page 6-2).
3. Remove the pico fuse:
   a. Remove the power supply PCB (see page 6-8); the pico fuse is located on the power supply PCB.
   b. Carefully unsolder the fuse, then remove the fuse.
4. Insert the new fuse: Solder the new pico fuse into position F1 on the power supply PCB.
5. Reassemble and calibrate the scale (see page 6-4, then page 4-3).

Replacing the Battery Pack

If the battery pack no longer holds its charge, replace it.

NOTE Partially discharging and recharging the rechargeable batteries repeatedly over time will lead to premature battery failure. To prolong battery health, occasionally run the scale on battery power alone until the cells are fully discharged, then fully recharge the battery for 2.5 hours.

Required parts:

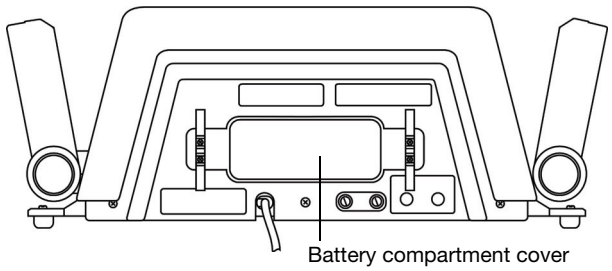
- Battery pack (part no. 401391)
- Screwdriver

WARNING **Only use the replacement Olympic Battery Pack (part no. 401391). Use of an incorrect battery pack may cause equipment damage, explosion, or fire.**

To replace the battery pack:

1. If the scale is on, press **ON/OFF** to turn off the scale, then unplug the power cord.
2. Loosen the two screws that secure the battery compartment cover to the back of the scale, disconnect the battery connection, then remove the battery pack (see Figure 6.5).

Figure 6.5 Replacing the battery pack



3. Place the new battery in the compartment, then connect battery connector.
4. Place the battery compartment cover into position, then gently tighten its screws.
5. Connect the power cord to an electrical outlet. The **CHARGING** light will illuminate.

NOTE Charge new batteries for approximately 2.5 hours to reach full charge before operating the Smart Scale on battery power.

6. Properly dispose of the nickel-cadmium (Ni-Cad) battery. The internal battery pack can be recycled by contacting the Rechargeable Battery Recycling Corporation (RBRC) at 1-800-822-8837 or www.rbrc.org. If the battery pack is not recycled, it must be disposed of as Hazardous Waste.

Testing the Membrane Switch Panel

Test the membrane switch panel if the **AVERAGE**/**UNLOCK**, **KG**/**LB**, or **ZERO** do not function.

Required Items:

- Allen wrench
- ESD protection
- Jumper wires (x2)
- Voltmeter

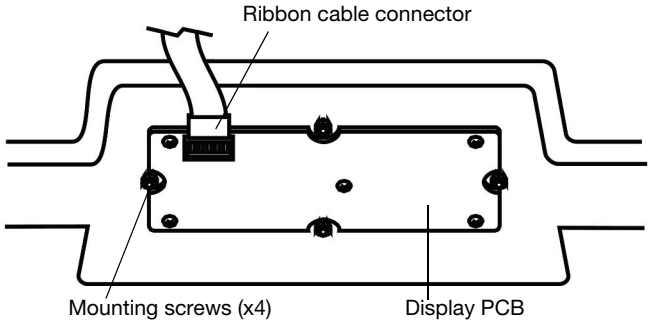
To test the membrane switch panel:

1 If the scale is on, press **ON/OFF** to turn off the scale, then unplug the power cord.

2 Disassemble the scale (see page 6-2).

3 Disconnect the ribbon cable connector from the display PCB (see Figure 6.6).

Figure 6.6 Disconnecting the ribbon cable connector



4 Verify that the membrane switch panel is properly connected.

NOTE If the **KG/LB** disabling switch has been activated (see page 2-1), **KG/LB** will be disabled and the scale will only display kilograms.

5 Using two small jumper wires, check the resistance of the malfunctioning switch at the corresponding pin on J2 of the display PCB (see Table 6.1).

Table 6.1 Control panel button pin out

Switch	J2 pin on display PCB
Common (ground)	**5, 6**
Zero	**2**
Average/Unlock	**4**
Kg/Lb	**3**
On/Off	**1**
Recall	**7**

6 Using the ground reference point of either pin 5 or 6, check the resistance. The resistance should be less than 50Ω (circuit closed) when pressed—

- If not, replace the membrane switch panel.

- If so, test the display PCB ribbon cable; replace if damaged.

7 Continue testing internal components, or reassemble and calibrate the scale (see page 6-4, then page 4-3).

Testing the Ribbon Cables

If the scale is not operating correctly test the ribbon cables, which are connected to the printed circuit boards, for continuity, open shorts, and mis-wires.

Required Items:

- ESD protection

To test the PCB ribbon cables:

1 If the scale is on, press **ON/OFF** to turn off the scale, then unplug the power cord.

2 Disassemble the scale (see page 6-2).

3 Remove the cable and check each wire for continuity.

4 Replace any damaged PCB ribbon cables.

5 Continue testing internal components, or reassemble and calibrate the scale (see page 6-4, then page 4-3).

Testing the Main Printed Circuit Board

If the scale lights do not illuminate or appears to be malfunctioning, a PCB may be damaged. Test the PCB to confirm that it is damaged prior to replacing.

NOTE

- Schematics, wiring diagrams, and PCB drawings are located on pages A-1–A-9.
- Before testing the PCB, check all fuses and connectors.

Required Items:

- ESD protection
- Voltmeter

To test the main PCB:

1 If the scale is on, press **ON/OFF** to turn off the scale, then unplug the power cord.

2 Disassemble the scale (see page 6-2).

3 Check the supply voltages (see Table 6.2).

Table 6.2 Main PCB test points

ID	Test Point	Expected Value
+5Vdigital	TP1	5.00 ±0.1Vdc
+5Vanalog	TP2	5.00 ±0.1Vdc
-5Vanalog	TP3	-5.00 ±0.5Vdc
GND	TP8	Reference

NOTE An S1 jumper installed on the main PCB (see page 3-15) will disable the **KG/LB** button, forcing the scale to only display kilograms.

4 If any voltages are out of tolerance, replace the main PCB.

5 Continue testing internal components, or reassemble and calibrate the scale (see page 6-4, then page 4-3).

Testing the Power Supply Printed Circuit Board

If the scale lights do not illuminate or appears to be malfunctioning, a PCB may be damaged. Test the PCB to confirm that it is damaged prior to replacing.

NOTE
- Schematics, wiring diagrams, and PCB drawings are located on pages A-1–A-9.
- Before testing the PCB, check all fuses and connectors.

Required Items:

- ESD protection
- Voltmeter

To test the power supply PCB:

1 If the scale is on, press **ON/OFF** to turn off the scale, then unplug the power cord.

2 Disassemble the scale (see page 6-2).

3 Check the supply voltages (see Table 6.3).

Table 6.3 Power supply PCB test points

ID	Test Point	Expected Value
Vin	J4-1	12.00 ±0.25Vdc
CHG/AC_ON	J3-1	5.00 ±0.25Vdc
GND	TP1	Reference
Vbat	TP2	7.2Vdc nominal
Vin	J4-1	12.00 ±0.25Vdc

4 If any voltages are out of tolerance, replace the power supply PCB.

5 Continue testing internal components, or reassemble and calibrate the scale (see page 6-4, then page 4-3).

Replacing the Power Supply Printed Circuit Board

If the scale lights do not illuminate or appears to be malfunctioning, a PCB may be damaged. Test the PCB to confirm that it is damaged prior to replacing.

NOTE
- Schematics, wiring diagrams, and PCB drawings are located on pages A-1–A-9.
- If appropriate, test the power supply PCB to determine if replacement is required (see page 6-10).

Required Items:

- ESD protection

To replace the power supply PCB:

1. If the scale is on, press **ON/OFF** to turn off the scale, then unplug the power cord.
2. Disassemble the scale (see page 6-2).
3. Remove the power supply PCB:
   a. Disconnect all connectors from the power supply PCB.
   b. Loosen and remove the mounting screws, then remove the power supply PCB.
4. Place the new power supply PCB into position, place and tighten the mounting screws, then connect the connectors to the power supply PCB.
5. Reassemble and calibrate the scale (see page 6-4, then page 4-3).

Testing the Display Printed Circuit Board

NOTE
- Schematics, wiring diagrams, and PCB drawings are located on pages A-1–A-9.
- Before testing the PCB, check all fuses and connectors.

To test the display PCB:

1. If the scale is disassembled, reassemble the scale (page 6-4).
2. Press and hold **KG/LB** while pressing **ON/OFF**.
3. Verify that all lights illuminate.

NOTE The charging signal only illuminates when the scale is plugged into a functioning electrical outlet.

4. Press **ON/OFF** to turn off the scale.

Replacing the Display Printed Circuit Board

NOTE
- Schematics, wiring diagrams, and PCB drawings are located on pages A-1–A-9.
- If appropriate, test the display PCB to determine if replacement is required (see page 6-11).

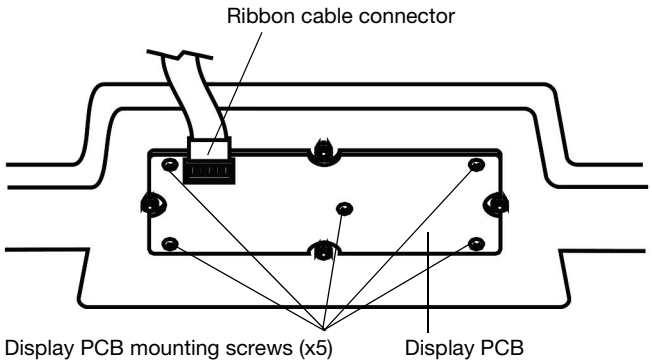
Required Items:

- ESD protection

To replace the display PCB:

1. If the scale is on, press **ON/OFF** to turn off the scale, then unplug the power cord.
2. Disassemble the scale (see page 6-2).
3. Disconnect the ribbon cable from the display PCB by loosening and removing the five mounting screws, then remove the display PCB (see Figure 6.7).

Figure 6.7 Removing the display PCB



4. Place the new PCB into position, place and tighten the five mounting screws, then connect the ribbon cable to the display PCB.
5. Reassemble and calibrate the scale (see page 6-4, then page 4-3).

Entering Counts Mode

If an electrical problem is suspect, such as the signal is beyond zero or the system appears unstable, enter counts mode.

To enter counts mode:

1. When the scale is off, press and hold **AVERAGE/UNLOCK** while pressing **ON/OFF**. AD (analog/digital) counts are shown.
2. To momentarily display the calibration coefficient (calconst), press **ZERO**. The calculation for conversion to grams is:

   grams=[(count - zero)*10,000]/calconst

3. Counts shown must be between 9000 and 13500 and remain steady. If out of range or fluctuation is more than ±4, contact Natus Medical for support (see page 5-4).

Returning for Service

When sending equipment for service:

1. Contact Natus Customer Service for a Return Merchandise Authorization (RMA) number and the location where the equipment should be sent.
2. Clean the device, securely package it,and include the RMA number on the outside of the box.
3. In the U.S., ship the equipment to:
   Natus Medical Incorporated
   5900 First Avenue South
   Seattle, WA 98108 USA

Section

7

Replacement Parts

NOTE Only use Natus Medical–approved parts with the Smart Scale.

Ordering Information

To order parts and accessories, contact:

Natus Medical Incorporated
Customer Service Department

Toll-free: 1-800-303-0306
Phone: +1-650-802-0400
Fax: +1-650-802-6620
Email: customer_service@natus.com

Parts and Accessories

When ordering, provide the item number to the customer service representative.

Table 7.1 Parts and accessories

Item Name / Description	Item Number
Battery pack	401391
Calibration weights, two totaling 12.5 kg ±1 gm, NIST traceable, nickel-plated steel	56357
Caster wheels (for cart/mobile base)	100066
Display panel assembly	400377
Display PCB assembly	400866
Fuse, Slo-Blo (AC), 3/8A, 250V~	200021
Fuse, Pico	200021
Power supply PCB assembly	400864
Ribbon cable, display to main board	200152
Roll-around base (cart/mobile base)	56359

Section

8

Specifications

Intended Use

The Olympic Smart Scale® Model 50/51 is intended for weighing infants and children up to 55 lb (25 kg).

Dimensions

Size – Scale, Both Ends Up

10-in. high x 28-in. wide x 22-in. deep
25.4-cm high x 71.1-cm wide x 55.9-cm deep

Size – Scale, Both Ends Down

10-in. high x 38.8-in. wide x 22-in. deep
25.4-cm high x 98.6-cm wide x 55.9-cm deep

Size – Model 51 Cart Only

29.5-in. high x 44-in. wide x 23.5-in. deep
74.9-cm high x 112-cm wide x 59.7-cm deep

Weight – Scale Only

51 lb 23.1 kg

Weight – Model 51 Cart Only

93 lb 42.2 kg

Electrical

Power Requirements

- Voltage: 120V~
- Consumption: 275mA
- Frequency (current): 60 ±5 Hz

Ground

Does not exceed 0.13Ω

Fuses

- One internal pico fuse
- Two internal 3AG Slo-Blo fuses

Battery Pack

Single pack with six 1700mAh SC Ni-Cad rapid-charge batteries; 7.2Vdc nominal

Environmental

Temperature

- Operating: 50–104°F 10–40°C
- Shipping: -40–158°F -40–70°C
- Storage: -4–113°F -20–45°C

Relative Humidity (RH)

- Operating: 10–95%, non-condensing
- Shipping/Storage: 10–100%, condensing

Operating Altitude (Maximum)

10,000 ft 3,000 m

Shipping/Storage Pressure

0.5–1.0 atm 500–1060 hPa

Controls

- **ON/OFF (DISPLAY):** Turns the scale display on or off.
- **KG/LB:** Changes the display between measurement units of pounds-ounces and kilograms.
- **AVERAGE/UNLOCK:** Calculates a four-second average an active patient and locks it on the display. Press again to unlock the display.
- **ZERO:** Cancels (tares out) the weight of any objects (e.g., blankets, toys) on the weighing platform; use before placing the patient on the platform.
- **RECALL:** Displays the last locked weight after the display has turned off.

Displays

Light-emitting diodes (LEDs) for weight display and indicator lights

External Connections

Hospital-grade power cord

Product

Item	REF
Smart Scale Model 50	56350
Smart Scale Model 51	56351

For additional items, see *Parts and Accessories* on page 7-1.

Regulatory, Electrical Safety, and Classifications

- FDA Class 1, Patient Scale
- Health Canada Class I
- CSA Class I
- CSA 601.1
- IEC 60601-1-2
- UL 60601-1
- Ordinary Equipment (IPXØ)
- Type B Applied Part

Service

Service can be performed by hospital technicians. See *Ordering Information* on page 7-1 for more information.

Warranty

One-year warranty.

Electromagnetic Compatibility

The Smart Scale complies with the requirements of IEC 60601-1-2 (2001). For information, see pages 8-3–8-5.

Product Disposal

Disposal of the Smart Scale does not require any special precautions. Dispose of according to your local disposal regulations.

The nickel-cadmium (Ni-Cad) battery must be disposed of properly. The internal battery pack can be recycled by contacting the Rechargeable Battery Recycling Corporation (RBRC) at 1-800-822-8837 or www.rbrc.org. If the battery pack is not recycled, it must be disposed of as Hazardous Waste.

Electromagnetic Specifications – Manufacturer's Declaration

The Olympic Smart Scale is intended for use in the electromagnetic environment specified below. The customer or the user of the Smart Scale should assure that it is used in such an environment.

Table 8.1 Electromagnetic emissions

Emissions Test	Compliance	Electromagnetic Environment — Guidance
Radio Frequency (RF) Emissions CISPR 11	Group 1	The Smart Scale uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF Emissions CISPR 11	Class B	The Smart Scale is suitable for use in all establishments including domestic establishments and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic Emissions IEC 61000-3-2	Not applicable	
Voltage fluctuations/ flicker emissions IEC 61000-3-3	Not applicable	

Table 8.2 Electromagnetic immunity

Immunity Test	IEC 60601 Test Level	Compliance Level	Electromagnetic Environment — Guidance
Electrostatic Discharge (ESD) IEC 61000-4-2	±6 kV contact ±8 kV air	±6 kV contact ±8 kV air	Floors should be wood, concrete, or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient/burst IEC 61000-4-4	±2 kV for power supply lines ±1 kV for input/output lines	±1 kV for power supply lines Not applicable	Mains power quality should be that of a typical commercial or hospital environment. Filters on the power input lines may be necessary (see *Troubleshooting* on page 5-1).
Surge IEC 61000-4-5	±1 kV differential mode ±2 kV common mode	±1 kV differential mode ±2 kV common mode	Mains power quality should be that of a typical commercial or hospital environment.
Voltage dips, short interruptions, and voltage variations on power supply input lines IEC 61000-4-11	<5% U_T (>95% dip in U_T) for 0.5 cycle 40% U_T (60% dip in U_T) for 5 cycles 70% U_T (30% dip in U_T) for 25 cycles <5% U_T (>95% dip in U_T) for 5 seconds	<5% U_T (>95% dip in U_T) for 0.5 cycle 40% U_T (60% dip in U_T) for 5 cycles 70% U_T (30% dip in U_T) for 25 cycles <5% U_T (>95% dip in U_T) for 5 seconds	Mains power quality should be that of a typical commercial or hospital environment. If the user of the Smart Scale requires continued operation during power mains interruptions, it is recommended that the Smart Scale be powered from an uninterruptible power supply or a battery.
Power frequency (50/60 Hz) magnetic field IEC 61000-4-8	3 A/m	3 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.

NOTE U_T is the alternating current (ac) mains voltage prior to the application of the test level.

Table 8.3 Electromagnetic immunity

Immunity Test	IEC 60601 Test Level	Compliance Level	Electromagnetic Environment — Guidance
			Portable and mobile RF communications equipment should be used no closer to any part of the Smart Scale, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter.
Conducted RF IEC 61000-4-6	3 Vrms 150 kHz to 80 MHz	3 V	**Recommended separation distance:** $d = 1.2\sqrt{P}$
Radiated RF IEC 61000-4-3	3 V/m 80 MHz to 2.5 GHz	1 V/m	$d = 3.5\sqrt{P}$ 80 MHz to 800 MHz $d = 7.0\sqrt{P}$ 800 MHz to 2.5 GHz ...where (P) is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and (d) is the recommended separation distance in meters (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey,[1] should be less than the compliance level in each frequency range.[2] Interference may occur in the vicinity of equipment marked with the following symbol:

1. Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the Smart Scale is used exceeds the applicable RF compliance level above, the Smart Scale should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as re-orienting or relocating the Smart Scale.
2. Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.

NOTE

- At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.
- These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects, and people.

Recommended Separation Distances Between Portable and Mobile RF Communications Equipment and the Olympic Smart Scale

The Smart Scale is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the Smart Scale can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the Smart Scale as recommended below, according to the maximum output power of the communications equipment.

Table 8.4 Recommended separation distances

Rated maximum output power of transmitter in watts (W)	**150 kHz to 80 MHz** $d = 1.2\sqrt{P}$	**80 MHz to 800 MHz** $d = 3.5\sqrt{P}$	**800 MHz to 2.5 GHz** $d = 7.0\sqrt{P}$
0.01	0.12	0.35	7.0
0.1	0.38	1.1	2.2
1	1.2	3.5	7.0
10	3.8	11	22
100	12	35	70

For transmitters rated at a maximum output power not listed above, the recommended separation distance (*d*) in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where (*P*) is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

NOTE

- At 80 MHz and 800 MHz, the separation distance for the higher frequency range applies.
- These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects, and people.

Drawings and Schematics

Figure A.1 Smart Scale, Model 50/51 — Power supply PCB assembly, Drawing No. 400864, Rev. C

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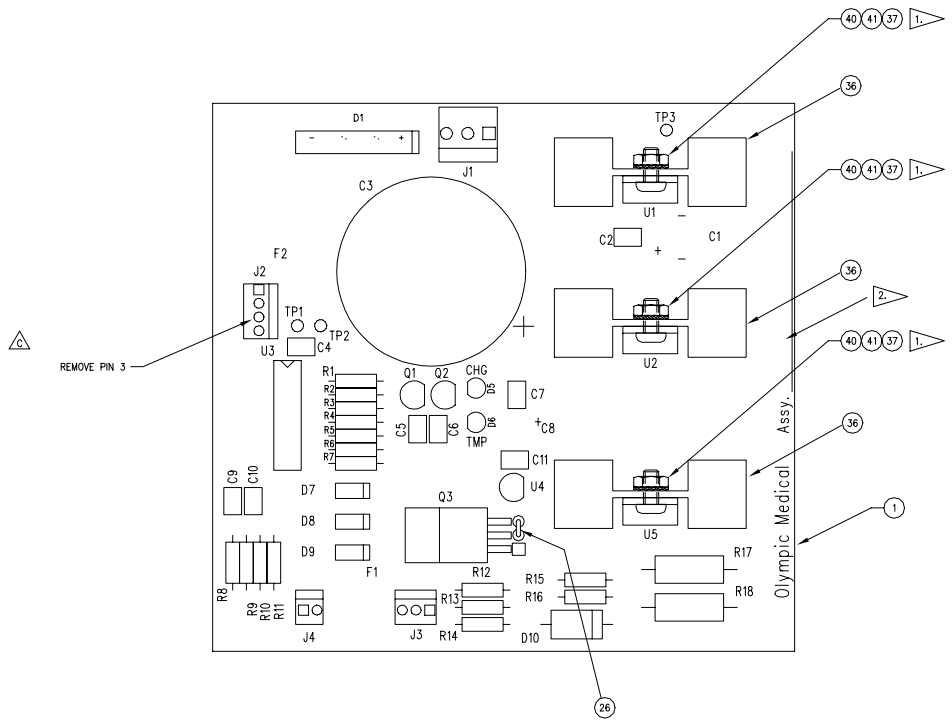

NOTES:

1. APPLY HEATSINK COMPOUND ITEM #37 BETWEEN ITEMS #4 , #5 AND ITEM 36.
2. WRITE IN WITH PERMANENT BLACK MARKER THE CURRENT ASSEMBLY AND DASH NUMBER.
3. Q3 NOT INSTALLED

REVISIONS				
LTR	DESCRIPTION	ECN	DATE	APPROVAL
–	PRODUCTION RELEASE	5817	6/10/96	DJD
A	ITEM 17 WAS –641	6112	1/22/97	DJD
B	NCD –01, ADDED –501	7689	1/31/02	DJD
C	ADDED REMOVE PIN CALLOUT, ITEM 10 WAS 47uF, ITEM 1 WAS –501, ITEM 44 WAS –509			

–	–	1	45	200021–617	FUSE (400mA SLO BLO)	F1
C	–	–	3	44	200113–507	TESTPOINT	TP1, TP2, TP3
–	–	–	43	–	–	
–	–	1	42	200021–619	FUSE (1A SLO BLO)	F2
–	–	3	41	–	NUT, HEX KEP 4–40 PLTD STL	
–	–	3	40	–	SCREW, PAN HEAD PHILLIPS, 4–40 X .25 LG PLTD STL	
–	–	2	39	200020–513	FUSEHOLDER	F1, F2
–	–	–	38	–	–	
–	–	AR	37	900006–01	HEAT SINK COMPOUND 1.	
–	–	3	36	100206–507	HEATSINK	
–	–	1	35	200044–519	CONNECTOR, WAFER	J4
–	–	1	34	200121–01	WAFER, MOLEX PIN CONNECTOR	J1
–	–	1	33	200044–515	CONNECTOR, WAFER	J3
–	–	1	32	200044–517	CONNECTOR, WAFER	J2
–	–	2	31	200064–503	LED, DISPLAY	D5, D6
–	–	1	30	200068–543	DIODE, BRIDGE (GBU401)	D1
–	–	1	29	200068–513	DIODE, SILICON (1N5400)	D10
–	–	3	28	200068–503	DIODE, SILICON (1N4003)	D7, D8, D9
–	–	2	27	200066–503	TRANSISTOR (NPN 2N3904)	Q1, Q2
–	–	1	26	–	LEAD, RESISTOR	Q3
–	–	1	25	200092–661	RESISTOR, FIXED METAL FILM (118K 1/10–1/8W)	R14
–	–	1	24	200092–659	RESISTOR, FIXED METAL FILM (590K 1/10–1/8W)	R13
–	–	1	23	200092–591	RESISTOR, FIXED METAL FILM (30.1K 1/10–1/8W)	R7
–	–	1	22	200092–589	RESISTOR, FIXED METAL FILM (6.04K 1/10–1/8W)	R6
–	–	1	21	200092–587	RESISTOR, FIXED METAL FILM (63.4K 1/10–1/8W)	R5
–	–	1	20	200092–585	RESISTOR, FIXED METAL FILM (2.80K 1/10–1/8W)	R10
–	–	1	19	200092–563	RESISTOR, FIXED METAL FILM (3.65K 1/10–1/8W)	R11
–	–	2	18	200092–657	RESISTOR, FIXED METAL FILM (3.3ohm 2W)	R17, R18
–	–	1	17	200088–587	RESISTOR, FIXED CARBON (100ohm 1/2W)	R12
–	–	2	16	200088–519	RESISTOR, FIXED CARBON (100K 1/4W)	R8, R9
–	–	1	15	200088–637	RESISTOR, FIXED CARBON (240ohm 1/4W)	R16
–	–	2	14	200088–511	RESISTOR, FIXED CARBON (10K 1/4W)	R1, R2
–	–	1	13	200088–631	RESISTOR, FIXED CARBON (510K 1/4W)	R15
–	–	2	12	200088–525	RESISTOR, FIXED CARBON (1K 1/4W)	R3, R4
–	–	1	11	200094–521	CAPACITOR, ELECTROLYTIC (15,000μF 35WVDC)	C3
C	–	–	1	10	200094–519	CAPACITOR, ELECTROLYTIC (10uF 35WVDC)	C8
–	–	6	9	200108–01	CAPACITOR, MONOLITHIC CERAMIC (.1μF 50WVDC)	C4, C5, C6, C9, C10, C11
–	–	1	8	200094–553	CAPACITOR, ELECTROLYTIC (220 35WVDC)	C1
–	–	1	7	200108–531	CAPACITOR, MONOLITHIC CERAMIC (1μF)	C2
–	–	1	6	200108–507	CAPACITOR, MONOLITHIC CERAMIC (.33μF 50V)	C7
–	–	2	5	200112–513	REGULATOR, VOLTAGE (ADJUSTABLE LM350)	U2, U5
–	–	1	4	200112–525	REGULATOR, VOLTAGE (12V LM2940CT–12)	U1
–	–	1	3	200112–519	REGULATOR, VOLTAGE (5V 78L05)	U4
–	–	1	2	200093–617	IC, (BATTERY CHARGER BQ2003)	U3
C	–	–	1	1	301681–503	PCB, POWER SUPPLY	
				400864–501	POWER SUPPLY PCB ASSY.	
				PART NO.	DESCRIPTION	

PARTS LIST

UNLESS OTHERWISE SPECIFIED			DO NOT SCALE DRAWING			OLYMPIC MEDICAL CORP SEATTLE, WASHINGTON
ALL DIM. IN INCHES	LINEAR TOL.	.XX	DRAWN	MJG	6/5/96	
		.XXX	CHECK	MMM	6/10/96	PCB ASSY., POWER SUPPLY
	ANGLE TOL.		ENGR.	DJD	6/10/96	
MATL.			MFG.	SLH	6/11/96	SIZE D 400864
FINISH			QUAL. C	MMM	6/11/96	SCALE 2:1 REV. C SHEET 1 OF 1
			MRKTG.			

ITEM NO. –501

QTY PER ASSY.

Figure A.2 Smart Scale, Model 50/51 – Display PCB assembly, Drawing No.400866, Rev. A

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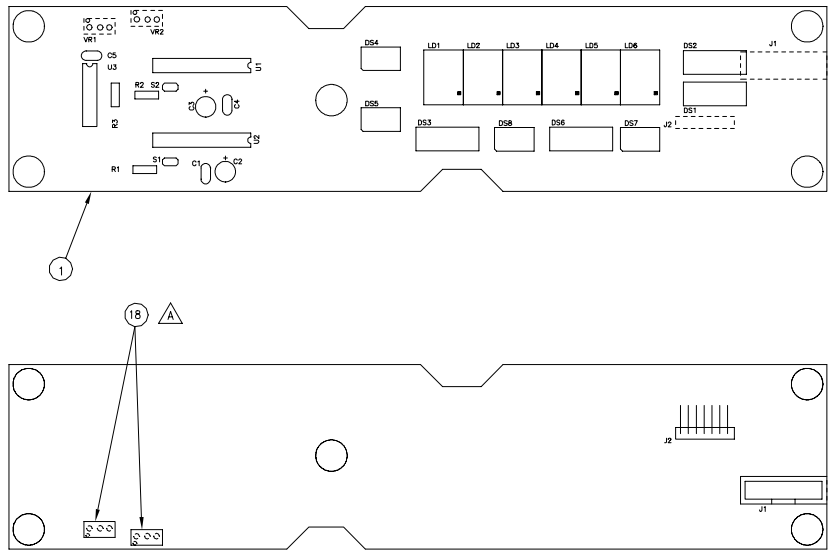
REVISIONS				
LTR	DESCRIPTION	ECN	DATE	APPROVAL
–	PRODUCTION RELEASE	5817	6/10/96	DJD
A	ITEM #18 WAS LEAD, RESISTOR	6046		



–	–	–	20	–	–	
–	–	–	19	–	–	
A	–	–	2	18	200159–525	POTENTIOMETER, TRIMMING VR1, VR2
–	–	–	17	–	–	
–	–	1	16	200044–503	CONNECTOR, WAFER	J2
–	–	1	15	200166–505	CONNECTOR, SOCKET HEADER	J1
–	–	3	14	–	LEAD, RESISTOR	S1, S2
–	–	4	13	200114–505	LED, LIGHT BAR (RED)	DS1, DS2, DS3, DS6
–	–	2	12	200114–515	LED, LIGHT BAR (RED)	DS7, DS8
–	–	1	11	200114–513	LED, LIGHT BAR (GRN)	DS4
–	–	1	10	200114–511	LED, LIGHT BAR (YEL)	DS5
–	–	6	9	200063–507	LED, DISPLAY	LD1–LD6
–	–	–	8	–	–	
–	–	–	7	–	–	
–	–	3	6	200088–511	RESISTOR, FIXED CARBON (10K 1/4W 5%)	R1, R2, R3
–	–	2	5	200070–507	CAPACITOR, TANTALUM (10 μF 25 V)	C2, C3
–	–	3	4	200108–01	CAPACITOR, MONO CERAMIC (.1 μF 50V)	C1, C4, C5
–	–	1	3	200093–677	IC (MAX381CPE)	U3
–	–	2	2	200093–639	IC (MAX7219)	U1, U2
–	–	1	1	301529–501	PCB, DISPLAY	
				400866–01	PCB ASSY., DISPLAY	
				PART NO.	DESCRIPTION	

PARTS LIST

UNLESS OTHERWISE SPECIFIED
ALL DIM. IN INCHES — LINEAR TOL. .XX .XXX — ANGLE TOL.
MATL.
FINISH
QTY PER ASSY.
ITEM NO. –01

DO NOT SCALE DRAWING

DRAWN	MJG	6/3/96
CHECK	MMM	6/10/96
ENGR.	DJD	6/10/96
MFG.	SH	6/11/96
QUAL. C	MWM	6/11/96
MRKTG.		

OLYMPIC MEDICAL CORP
SEATTLE, WASHINGTON

PCB ASSY., DISPLAY
(SS50)

SIZE D — 400866

SCALE 1:1 — REV. A — SHEET 1 OF 1

Figure A.3 Smart Scale, Model 50/51 – Main PCB assembly, Drawing No.401094, Rev. E

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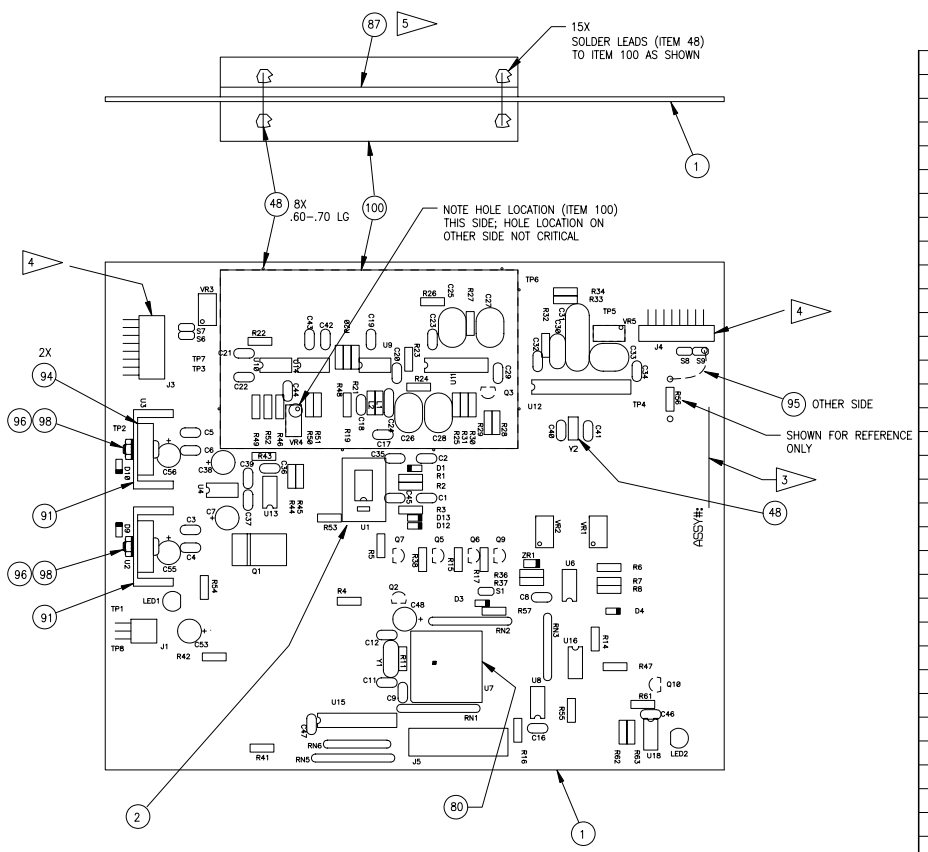


NOTES:

1. R– 4,5,7,15,16,17,25,28,30,31,36,38,42,55,57,61,62
2. C– 1,4,6,8,9,16,17,18,19,20,21,22,23,29,32,34,36,37,39,43,44,46,47
3. WRITE IN WITH PERMANENT BLACK MARKER THE CURRENT ASSEMBLY AND DASH NUMBER.
4. REMOVE PIN 3 FROM CONNECTORS J3 AND J4
5. ON THE EDGES OF ITEM 100, APPLY TAPE (ITEM 87) AS FOLLOWS:
   COMPONENT SIDE– ONE EDGE NEAREST TO C32
   OTHER SIDE– ALL FOUR EDGES
   ALTERNATE TO TAPE APPLICATION: USE .015–.030 THICK SHIMS BETWEEN PCB AND SHIELD, REMOVE SHIMS AFTER SOLDERING.

REVISIONS				
LTR	DESCRIPTION	ECN	DATE	APPROVAL
E	ADDED TO NOTE 5, ALTERNATE SHIM SPACING, CHANGED ITEM 11 WAS MAX 705			

QTY PER ASSY.		ITEM NO.		
	2	100	300386-501	SHIELD, EMI
	1	99	200088-661	RESISTOR, FIXED CARBON (2K 1/4 W 5%) R6
	2	98	–	NUT, KEP HEX 4-40 PLTD STL
	AR	97	900079-501	TAPE, POLYESTER 5
	2	96	–	SCREW, PH PHILLIPS 4-40 X .38 LG PLTD STL
	AR	95	900002-527	WIRE, ELECTRICAL
	AR	94	900006-01	HEAT SINK COMPOUND
	1	93	300437-509	HEADER, MODIFIED STRAIGHT (2 PIN) S1
	1	92	200166-503	CONNECTOR, (SOCKET HEADER) J5
	2	91	100206-503	HEATSINK
	1	90	200044-541	CONNECTOR, WAFER J1
	2	89	200044-509	CONNECTOR, WAFER J3, J4
	–	88	–	–
	2	87	200064-511	LED, DISPLAY (RED) LED1, LED2
	1	86	200116-507	CRYSTAL (32.768KHz) Y2
	1	85	200116-517	CRYSTAL (4Mz) Y1
	8	84	200113-507	TESTPOINT TP1–TP8
	1	83	200159-527	POTENTIOMETER, TRIMMING (5K) VR4
	–	82	–	–
	–	81	–	–
	1	80	200209-01	SOCKET, PLCC (44 PIN)
	3	79	200068-501	DIODE, SILICON (1N914) D1, D12, D13
	2	78	200068-503	DIODE, SILICON (1N4003) D10, D9
	2	77	200068-509	DIODE, SILICON (1N5817) D3,D4
	–	76	–	–
	–	75	–	–
	6	74	200066-513	TRANSISTOR (VN2222LL) Q2, Q7, Q5, Q6, Q9, Q10
	–	73	–	–
	1	72	200066-507	TRANSISTOR (2N2907) Q3
	–	71	–	–
	1	70	200066-517	TRANSISTOR (IRF9Z34) Q1
	1	69	200094-531	CAPACITOR, ELECTROLYTIC (47μF 25V) C53
		68		
	2	67	200108-519	CAPACITOR, MONO CERAMIC (100pF 100V) C2, C35
	1	66	200222-503	CAPACITOR, METAL POLYESTER (.1 μF 50V) C24
	1	65	200177-507	CAPACITOR, POLYPROPYLENE (.1μF 50V) C31
	–	64	–	–
	1	63	200092-665	RESISTOR, FIXED METAL FILM (3.92 1%) R52
	1	62	200177-505	CAPACITOR, POLYPROPYLENE (.0047μF 50V) C30
	1	61	200108-503	CAPACITOR, MONO CERAMIC (270pF 50V) C42
	2	60	200108-525	CAPACITOR, MONO CERAMIC (27pF 100V) C11,C12
	2	59	200108-527	CAPACITOR, MONO CERAMIC (15pF 100V) C40,C41
	3	58	200108-507	CAPACITOR, MONO CERAMIC (.33μF 50VDC) C3, C5, C45
	23	57	200108-01	CAPACITOR, MONO CERAMIC (.1μF 50VDC) 2
	–	56	–	–
	5	55	200070-513	CAPACITOR, TANTALUM (22μF 25V) C7, C38, C48, C55, C56
	–	54	–	–
	–	53	–	–
	1	52	200117-513	RESISTOR NETWORK (10K 8 PIN BUSSED SIP) RN3
	3	51	200117-523	RESISTOR NETWORK (10K 10 PIN BUSSED SIP) RN1, RN2, RN5
	5	50	200222-501	CAPACITOR, METAL POLYESTER (1μF 50V) C25, C26, C27, C28, C33
	1	49	200068-533	DIODE, SILICON (1N5226B) ZR1
	13	48	–	LEAD, RESISTOR S6, S7, S8, S9,Y2
	1	47	200092-581	RESISTOR, FIXED METAL FILM (20K 1%) R34
	1	46	200092-721	RESISTOR, FIXED METAL FILM (237K 1%) R33
			401094-503	MAIN PCB ASSY.
			PART NO.	DESCRIPTION

PARTS LIST CON'T

QTY PER ASSY.		ITEM NO.		
	1	45	200117-511	RESISTOR NETWORK (100K 8 PIN SIP) RN6
	1	44	200159-521	POTENTIOMETER, TRIM (100 Ω) VR3
	1	43	200092-643	RESISTOR, FIXED METAL FILM (604K 1%) R32
	1	42	200092-655	RESISTOR, FIXED METAL FILM (499Ω 1%) R21
	1	41	200092-639	RESISTOR, FIXED METAL FILM (294K 1%) R27
	2	40	200092-637	RESISTOR, FIXED METAL FILM (158K 1%) R24,R26
	–	39	–	–
	–	38	–	–
	1	37	200092-633	RESISTOR, FIXED METAL FILM (13K 1%) R23
	2	36	200092-501	RESISTOR, FIXED METAL FILM (10K 1%) R43,R44
	1	35	200092-647	RESISTOR, FIXED METAL FILM (51.1K 1%) R49
	–	34		
	–	33	–	–
	1	32	200088-685	RESISTOR, FIXED CARBON (180Ω,1/2W 5%) R41
	4	31	200088-519	RESISTOR, FIXED CARBON (100K 1/4W 5%) R1, R2, R3, R29
	1	30	200088-567	RESISTOR, FIXED CARBON (100.Ω 1/4W 5%) R22
	3	29	200092-551	RESISTOR, FIXED METAL FILM (499K 1%) R48,R50,R51
	2	28	200236-501	TOROID, FERRITE (60 Ω @ 100 MHz) L1, L2
	2	27	200092-631	RESISTOR, FIXED METAL FILM (22.1K 1%) R19, R20
	4	26	200088-581	RESISTOR, FIXED CARBON (10M 1/4W 5%) R8, R11, R37, R53
	17	25	200088-511	RESISTOR, FIXED CARBON (10K 1/4W 5%) 1
	1	24	200088-607	RESISTOR, FIXED CARBON (5.1Ω,1/4W 5%) R46
	2	23	200088-569	RESISTOR, FIXED CARBON (4.7K 1/4W 5%) R45, R14
	2	22	200159-501	POTENTIOMETER, TRIMMING (100K) VR1, VR2
	1	21	200088-577	RESISTOR, FIXED CARBON (2.2K 1/4W 5%) R47
	2	20	200088-525	RESISTOR, FIXED CARBON (1K 1/4W 5%) R54, R63
	1	19	400869-501	CHIP ASSY., PROGRAMMED U7
	1	18	200159-505	POTENTIOMETER, TRIMMING (20K) VR5
	–	17		
	1	16	200093-645	IC, INTEGRATED CIRCUIT (74HC244AN) U15
	1	15	401070-01	CHIP ASSY., PROGRAMMED U18
	1	14	200093-583	IC, INTEGRATED CIRCUIT (OP07EP OP AMP) U14
	1	13	200093-541	IC, INTEGRATED CIRCUIT (LM10CN OP AMP VOLT. REF.) U13
	1	12	200175-511	IC, MEMORY (24LC01BI/P CMOS EEPROM) U8
	1	11	200093-643	IC, INTEGRATED CIRCUIT (MAX 706) U16
	2	10	200112-505	REGULATOR, VOLTAGE (3052V) U2, U3
	1	9	200093-673	IC, INTEGRATED CIRCUIT (MAX132) U12
	1	8	200093-575	IC, INTEGRATED CIRCUIT (CD4066BCN) U11
	1	7	200093-691	IC, (OP AMP, BURR BROWN OPA602AP) U10
	1	6	200093-655	IC, INTEGRATED CIRCUIT (1NA114AP) U9
	–	5		
	1	4	200093-587	IC, INTEGRATED CIRCUIT (TLC272ACPA) U6
	1	3	200093-539	IC, INTEGRATED CIRCUIT (7662ACPA) U4
	1	2	401541-01	ADAPTER PCB ASSY., FLIP FLOP U1
	1	1	302107-503	PCB, SS MAIN
			401094-503	MAIN PCB ASSY.
			PART NO.	DESCRIPTION

PARTS LIST

QTY PER ASSY.	FINISH	UNLESS OTHERWISE SPECIFIED			DO NOT SCALE DRAWING			OLYMPIC MEDICAL CORP SEATTLE, WASHINGTON
		ALL DIM. IN INCHES	LINEAR TOL.	.XX	DRAWN	MJG	2/9/00	
				.XXX	CHECK	MMM	3/17/00	MAIN PCB ASSY.
			ANGLE TOL.		ENGR.	DJD	3/17/00	
		MATL.			MFG.	SLH	3/20/00	SIZE D 401094
					QUAL. C	MWM	3/20/00	
					MRKTG.			SCALE NONE REV. E SHEET 1 OF 1

Figure A.4 Smart Scale, Model 50/51 — Power supply schematic, Drawing No. 700141, Rev. –

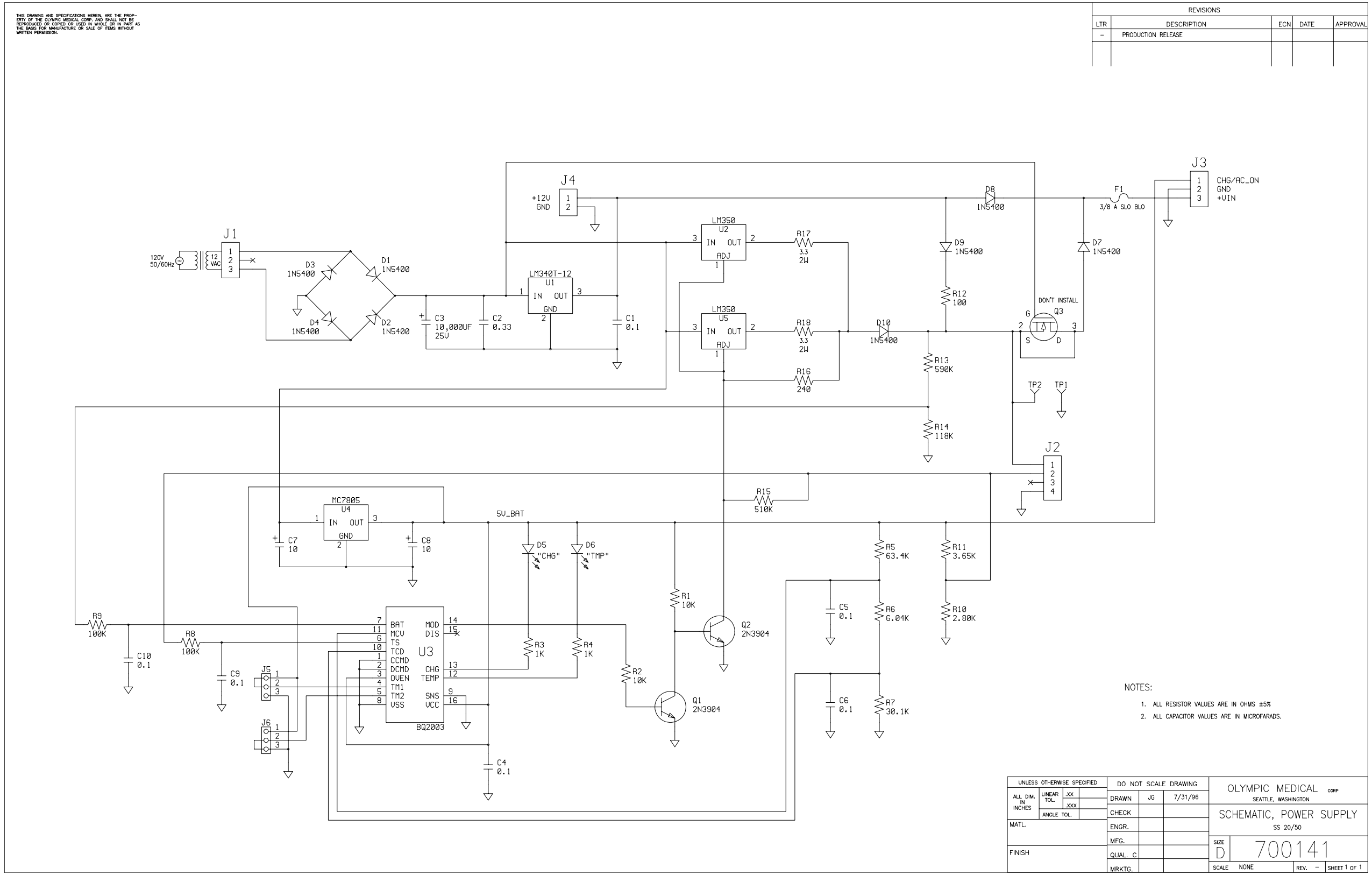


Figure A.5 Smart Scale, Model 50/51 — Display schematic, Drawing No. 700144, Rev. A

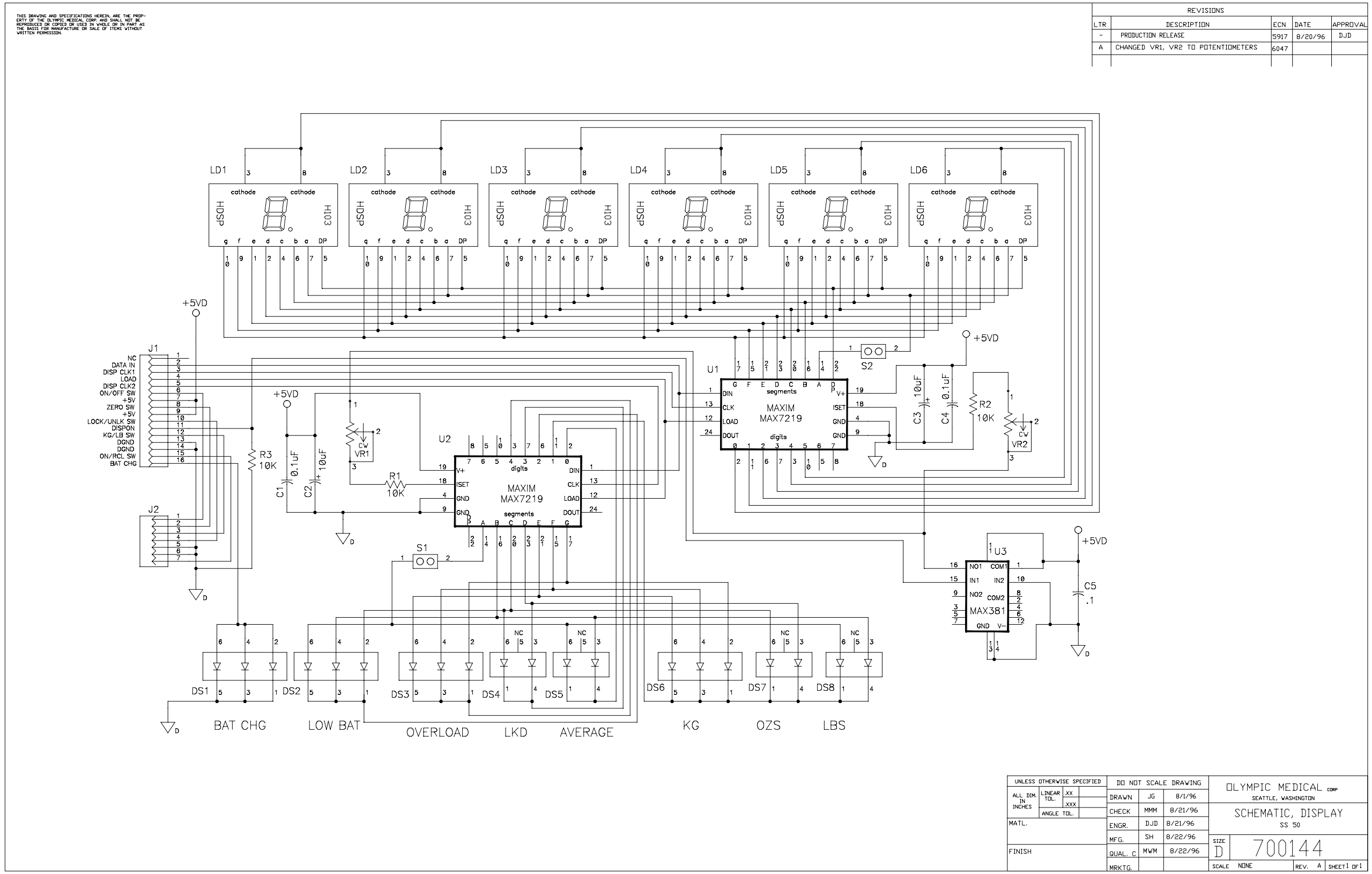
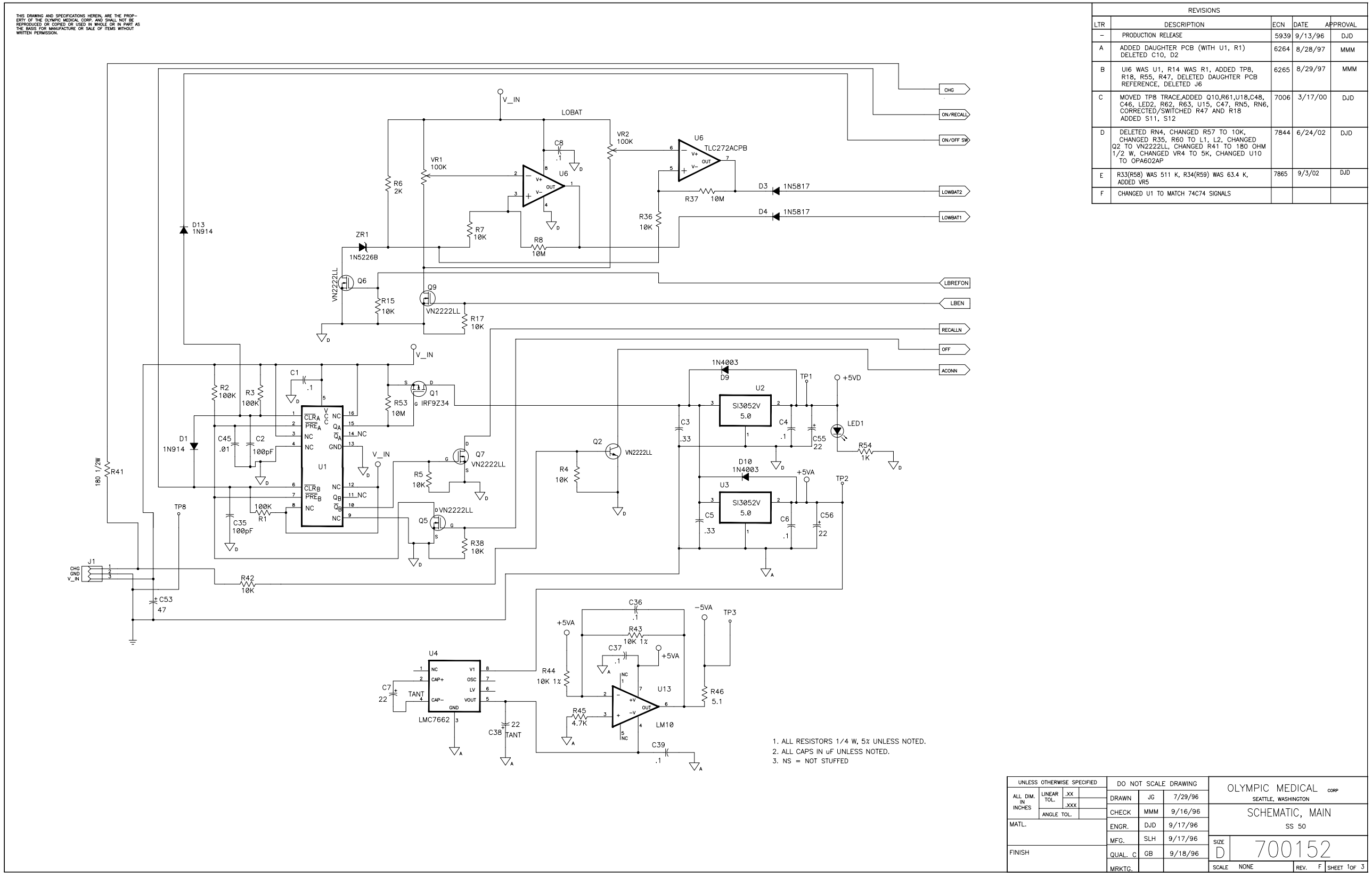


Figure A.6 Smart Scale, Model 50/51 — Main schematic, Drawing No. 700152, page 1, Rev. F



REVISIONS				
LTR	DESCRIPTION	ECN	DATE	APPROVAL
–	PRODUCTION RELEASE	5939	9/13/96	DJD
A	ADDED DAUGHTER PCB (WITH U1, R1) DELETED C10, D2	6264	8/28/97	MMM
B	UI6 WAS U1, R14 WAS R1, ADDED TP8, R18, R55, R47, DELETED DAUGHTER PCB REFERENCE, DELETED J6	6265	8/29/97	MMM
C	MOVED TP8 TRACE,ADDED Q10,R61,U18,C48, C46, LED2, R62, R63, U15, C47, RN5, RN6, CORRECTED/SWITCHED R47 AND R18 ADDED S11, S12	7006	3/17/00	DJD
D	DELETED RN4, CHANGED R57 TO 10K, CHANGED R35, R60 TO L1, L2, CHANGED Q2 TO VN2222LL, CHANGED R41 TO 180 OHM 1/2 W, CHANGED VR4 TO 5K, CHANGED U10 TO OPA602AP	7844	6/24/02	DJD
E	R33(R58) WAS 511 K, R34(R59) WAS 63.4 K, ADDED VR5	7865	9/3/02	DJD
F	CHANGED U1 TO MATCH 74C74 SIGNALS			

UNLESS OTHERWISE SPECIFIED			DO NOT SCALE DRAWING			OLYMPIC MEDICAL CORP SEATTLE, WASHINGTON
ALL DIM. IN INCHES	LINEAR TOL.	.XX	DRAWN	JG	7/29/96	
		.XXX	CHECK	MMM	9/16/96	SCHEMATIC, MAIN
	ANGLE TOL.		ENGR.	DJD	9/17/96	SS 50
MATL.			MFG.	SLH	9/17/96	SIZE D 700152
FINISH			QUAL. C	GB	9/18/96	SCALE NONE REV. F SHEET 1OF 3
			MRKTG.			

Figure A.7 Smart Scale, Model 50/51 – Main schematic, Drawing No. 700152, page 2, Rev. F

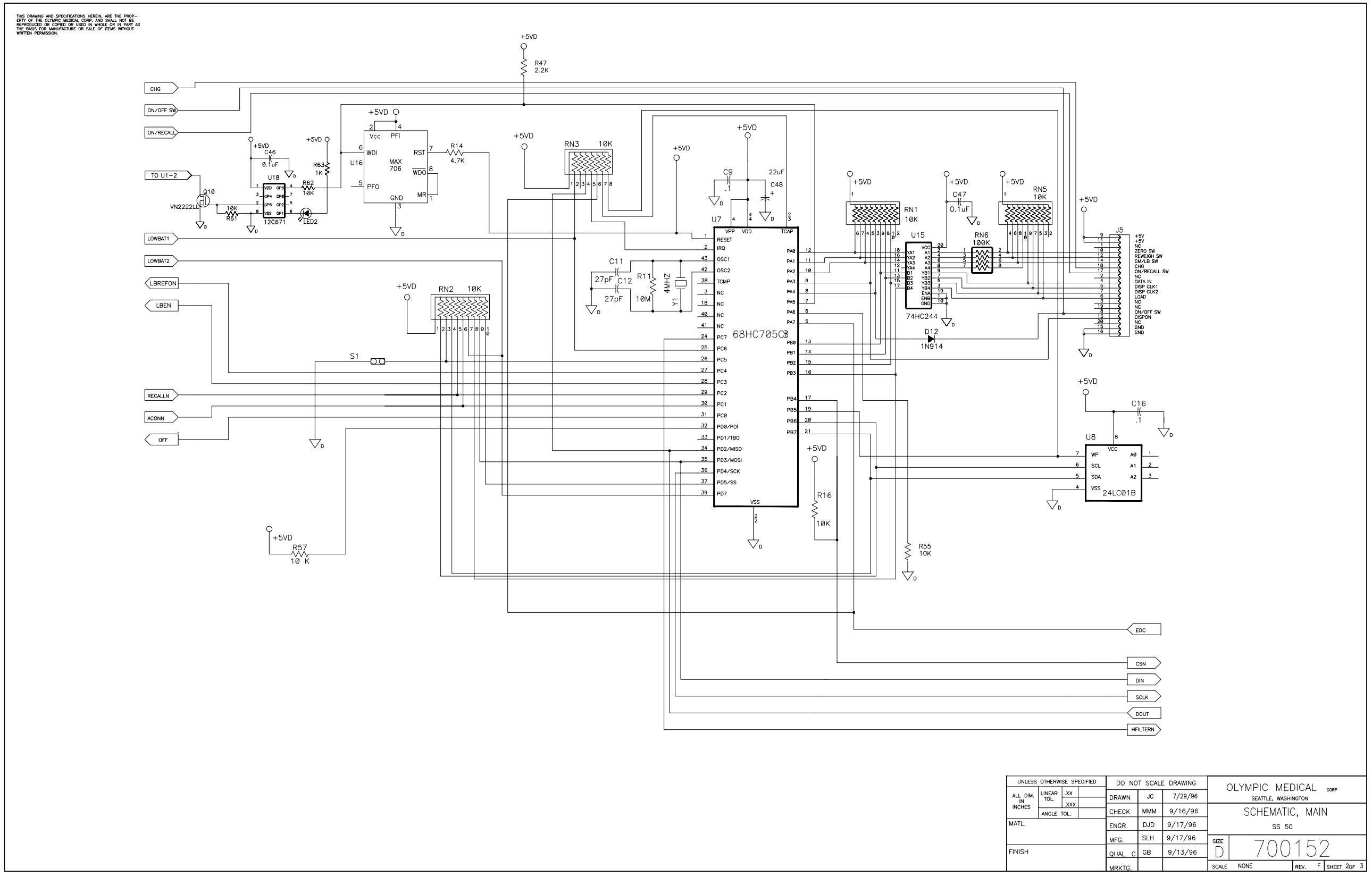
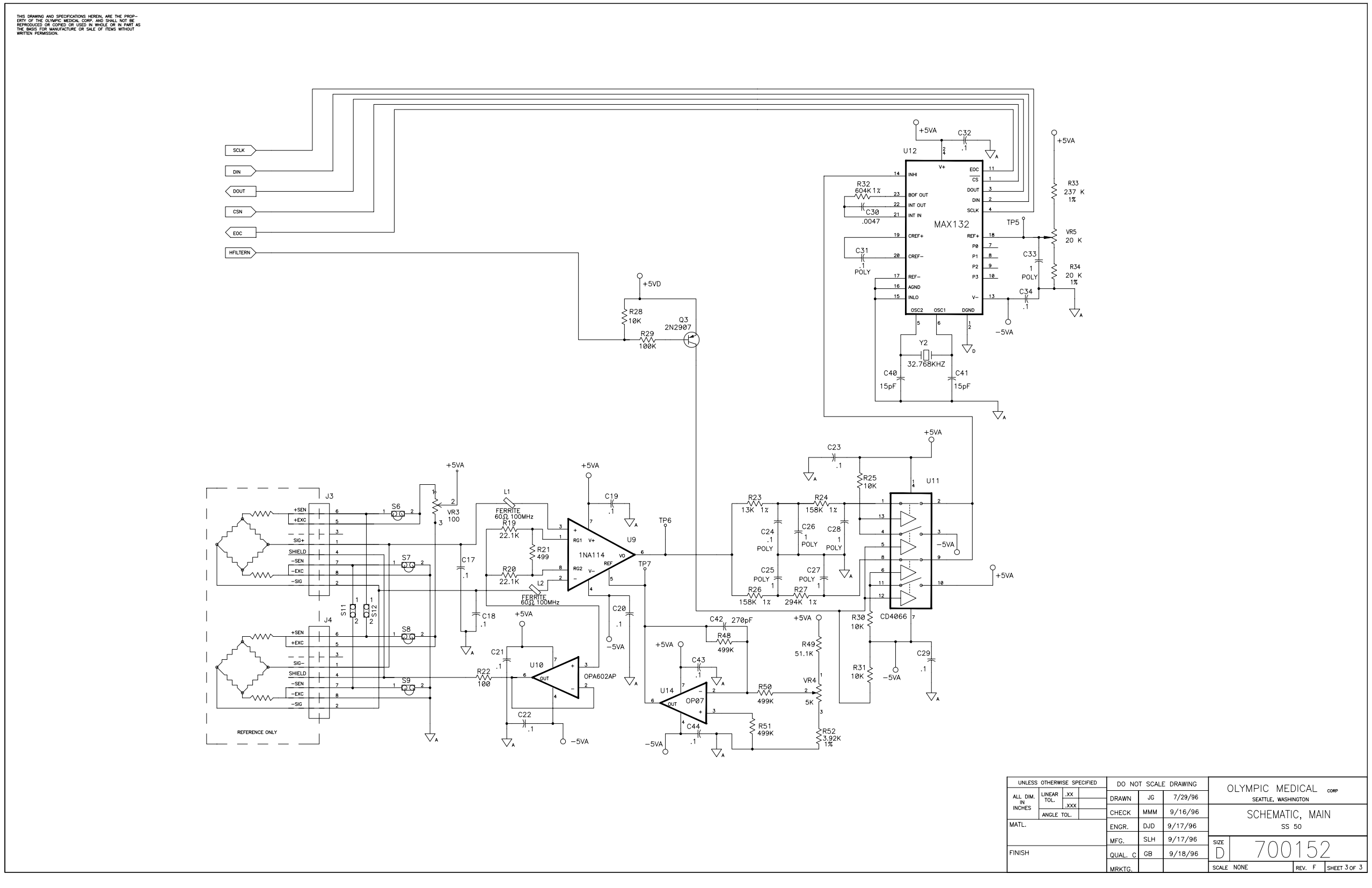


Figure A.8 Smart Scale, Model 50/51 – Main schematic, Drawing No. 700152, page 3, Rev. F



UNLESS OTHERWISE SPECIFIED	DO NOT SCALE DRAWING		OLYMPIC MEDICAL CORP SEATTLE, WASHINGTON
ALL DIM. IN INCHES — LINEAR TOL. .XX / .XXX — ANGLE TOL.	DRAWN	JG 7/29/96	SCHEMATIC, MAIN SS 50
MATL.	CHECK	MMM 9/16/96	
FINISH	ENGR.	DJD 9/17/96	
	MFG.	SLH 9/17/96	SIZE D 700152
	QUAL. C	GB 9/18/96	SCALE NONE REV. F SHEET 3 OF 3
	MRKTG.		

Figure A.9 Smart Scale, Model 50/51 – Wiring diagram, Drawing No. 700251, Rev. A